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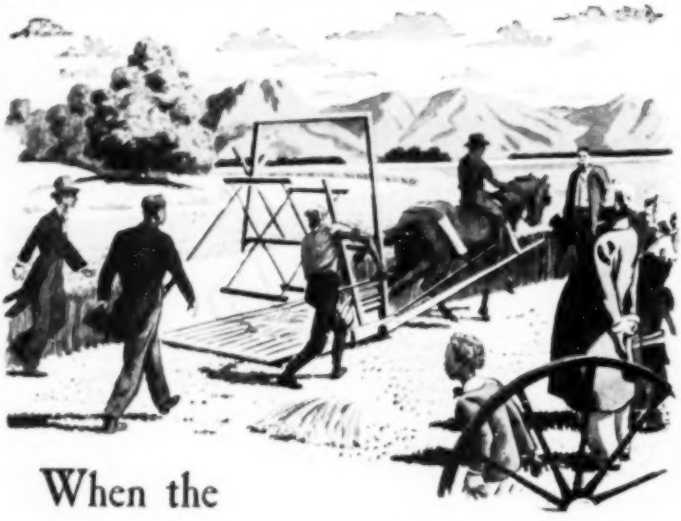

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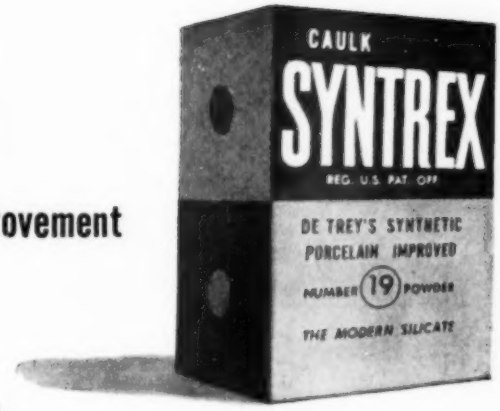

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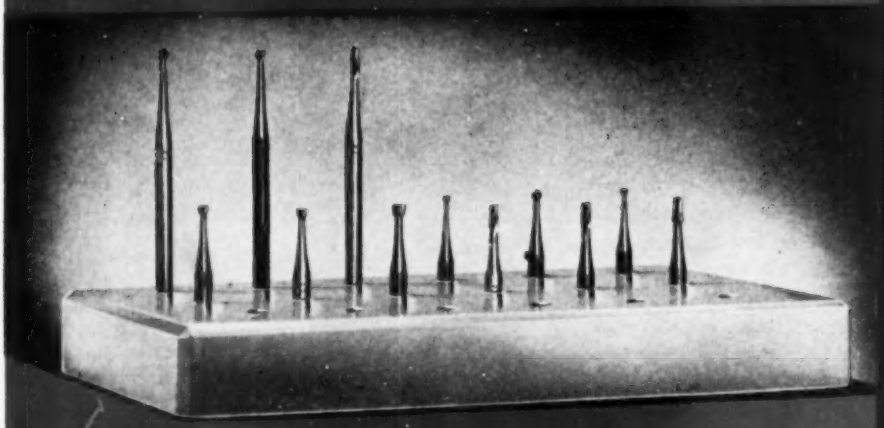

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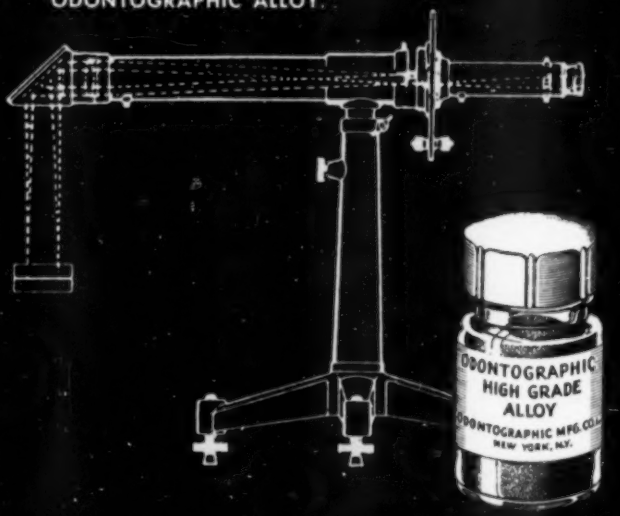

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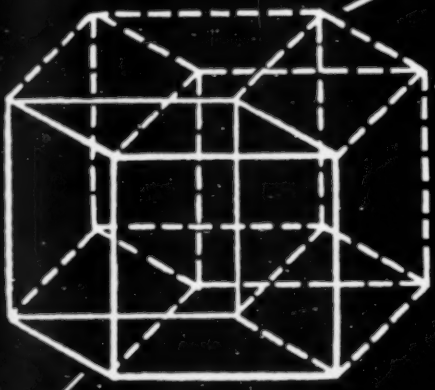

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†Bragdon, C.: *A Primer of Higher Space, New York, Alfred A. Knopf, 1923, Plate 1.*

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SEPTEMBER 1953 VOLUME 47 • NUMBER 3

JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The connective tissue fibers of the marginal gingiva

Sumter S. Arnim, D.D.S., Ph.D., and David A. Hagerman, D.D.S., Houston, Texas

Horizontal serial sections of human, monkey and rat jaws reveal a compact band of connective tissue encircling the teeth within the marginal gingiva. This circumferential band is seen in normal tissue of the three species. The purpose of this presentation is to describe this connective tissue band and discuss its function.

The circular band is best seen in horizontal sections of healthy submucosa underlying the epithelium of the margin of the gum. It is composed of many connective tissue cells with their closely interwoven collagenous fibers forming a compact well-differentiated group. Some of the fibers are embedded in the cementum of the teeth, others in the crest of the alveolar bone, although the large majority are not attached to bone or cementum but form an encircling band within the gingival margin.

REVIEW OF LITERATURE

When this study was first begun it was assumed this band of connective tissue encircling the tooth in a purse string fashion had been described previously. It was thought to be an integral part of that group of fibers entitled *ligamentum circulare dentis*.[1] These assumptions were incorrect as a review of the available literature revealed a variety of interpretations concerning the circular ligament and little description was found of the fibers described in this study.

The term *ligamentum circulare dentis* seems to have originated with von Koel-

Dental Branch, University of Texas.

The rat, monkey and autopsy specimens used in this study are from the Dental Study Unit, Yale University School of Medicine, B. G. Anderson, director; and the Dental School of the Medical College of Virginia, Harry Lyons, dean.

1. Goldman, Henry M. Periodontia ed. 2. St. Louis, C. V. Mosby Co., 1949, p. 36.

liker.[2] His drawings showed fibers arising from the alveolar crest labeled *ligamentum circulare dentis*. The description stated,

> At the alveolar margin the periosteum merges with the submucosa of the free gingiva. The fibrous bundles radiate from the alveolar margin and some go diagonally to the cementum at the neck of the tooth where they insert toward the crown. They form a ringlike connection from the tooth to the alveolar margin, the ligamentum circulare dentis.

Fish[3] still uses the term in his writings and in a recent letter says:

> The "Ligamentum Circulare" I have always thought to be merely a convenient name for the fibres of the periodontal membrane attaching the cervical part of the cementum to the free gum margin. The ligament, therefore, might be called circular but the fibres would run radially and certainly not in a circular direction.

Oppenheim[4] also uses the term *ligamentum circulare* and says it runs transversely across the septum from one tooth to the adjacent one uniting them firmly. It is his opinion that the importance of this fiber group is insufficiently emphasized. He states:

> These powerful fibers stretching across the septa, giving off strong bundles to these and partly to the gums, prove to be the most resistive tissue with which we are dealing in our operations.

Mummery[5] described the circular ligament as a very strong bundle of fibers springing from the upper surface and borders of the alveolar crest.

G. V. Black[6] wrote,

> . . . a fairly strong fibrous bundle turning toward the crown into the gingiva, especially on the labial side. Nearer the border of the alveolar wall the fibers pass on under the gum tissue proper and are continuous with the outer layer of the periosteum of the outer surface of the alveolar walls. As these pass the margins of the alveolus, fibers springing out of the bone, first decussate with, and then become mingled with them; thus forming a very firm support to the gingivae. This bundle has been termed the dental ligament.

In Churchill's[7] translation of Meyer's *Normal Histology of Human Teeth* a definite system of fiber groups is described at the gingival border. A circular group of fibers is listed in this system. It is said to lie within an angle formed by the free gingival and alveolar crest fibers and circles around the cervical portion of the tooth. It is shown in cross section in several photomicrographs and two diagrams. Meyer states,

> The above described definite system of fiber groups was formerly designated as the "ligamentum circulare dentis," and to this circular ligament were ascribed special protective functions in regard to the underlying tissue parts. These fiber bundles, however, do not possess such special protective purposes, they are simply parts of the attachment apparatus whose orientation is functionally determined. The name "ligamentum circulare" is in itself a misnomer and should be discarded, because only the smallest part of this fiber group runs circularly around the tooth.

Cross sections are described, but the photomicrographs are all of longitudinal sections.

Strang[8] states,

> The fourth group [of fibers] are arranged like a constrictor muscle around the gingival margin and keep the gingival tissue in close contact with the neck of the tooth.

He wrote recently that the source of this observation may be found in Noyes'[9] text.

Noyes[9] describes a dental ligament and also remarks,

2. Koelliker, A. Handbuch der Gewebelehre des Menschen. Leipzig, Wilhelm Engelman, 1902, p. 95-96.

3. Fish, E. Wilfred. Parodontal diesease. London, Eyre & Spottiswoode, 1944, p. 23.

4. Oppenheim, Albin. Tissue changes, particularly of the bone, incident to tooth movement. Am. Orthodont. 3:57 Oct. 1911; 3:113 Jan. 1912.

5. Mummery, J. H. The microscopic and general anatomy of the teeth, ed. 2. Oxford, Oxford University Press, 1924, p. 310.

6. Black, G. V. A study of the histological characters of the periosteum and peridental membrane. Chicago, W. T. Keener, 1887, p. 75-76.

7. Churchill, Herman R. Meyer's normal histology and histogenesis of the human teeth and associated parts. Philadelphia, J. B. Lippincott, 1935, p. 147.

8. Strang, R. H. W. Textbook of orthodontia, ed. 3. Philadelphia, Lea & Febiger, 1950, p. 203.

9. Noyes, F. B. A textbook of dental histology and embryology. Philadelphia, Lea & Febiger, 1912, p. 285-286.

The lingual gingivus is broader and flatter, and the fibers passing up into it form a strong and well defined band. Under higher magnification, fibers would be seen cut transversely in the gingivus, which pass around the tooth, helping to hold it closely against the enamel.

These fibers are plainly seen in Figure 222 of his text. They appear to be in the same position as those to be described in this study. It is of interest that Noyes' section came from near the cemento-enamel junction of the temporary incisors of a sheep.

Hopewell-Smith,[10] in referring to Stohr's *Textbook of Histology*, says the gingival portion of the periosteum is

10. Hopewell-Smith, Arthur. Normal and pathological histology of the mouth, vol. 1, ed. 2. Philadelphia, P. Blakiston's Son & Co., 1918, p. 166.

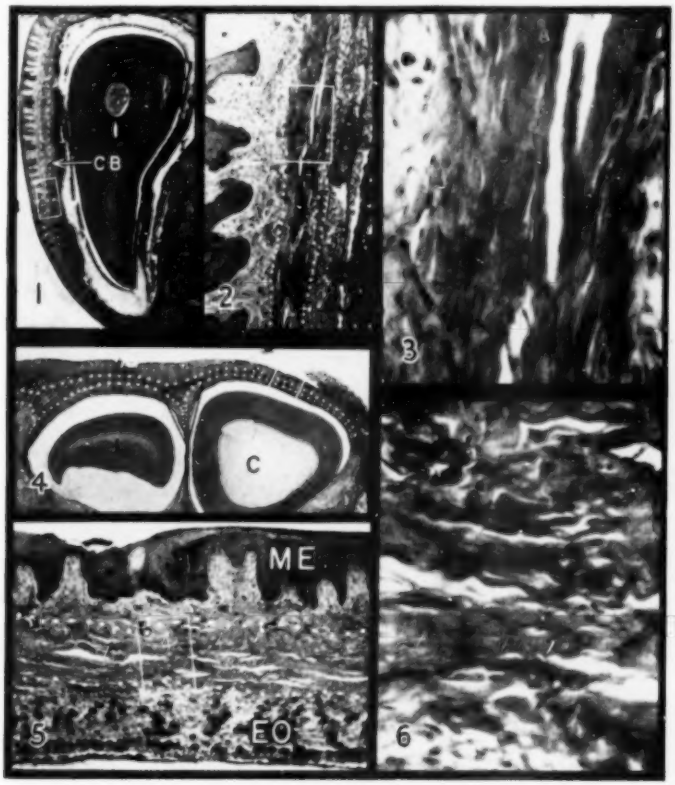

Fig. 1 • (1) Horizontal section, 1.8 mm. from gingival margin, upper central incisor, male, age 10 months. Circular band, CB, outlined with white dots. (2) Magnification of region marked with rectangle in (1). Circular band indicated by white dots. (3) High-power magnification of circular band indicated by rectangle in (2). (4) Horizontal section, central incisor shown in (1) with lateral incisor, 3.5 mm. from gingival margin. C, central incisor; L, lateral incisor; circular band indicated by white dots. (5) Magnification of region marked with white rectangle in (4). EO, remains enamel organ; ME, mouth epithelium. (6) High-power magnification of circular band indicated by rectangle in (5).

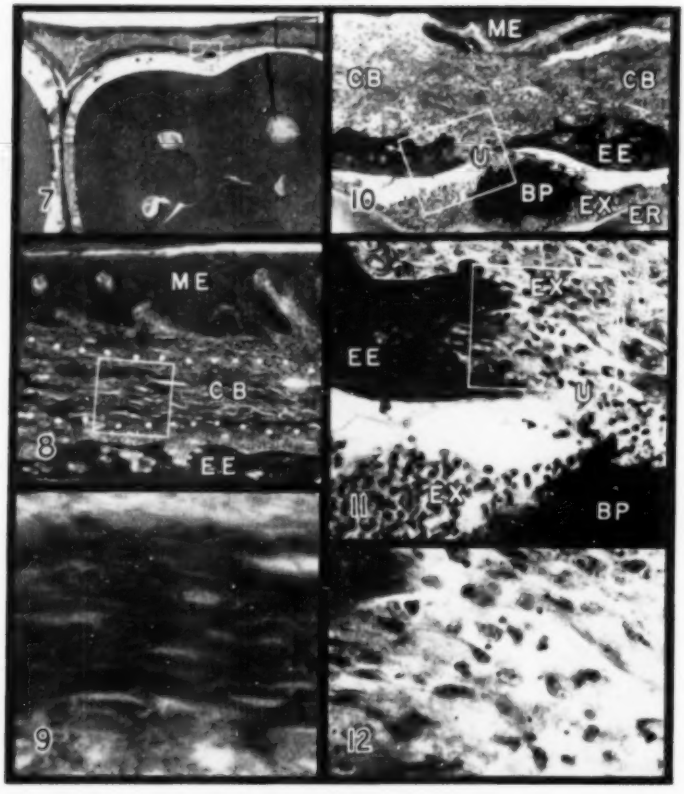

Fig. 2 • (7) Horizontal section buccal and interproximal lower first and second molars, monkey. (8) Magnification of healthy circular band seen in black rectangle (7). EE, enamel epithelium; ME, mouth epithelium; CB, circular band. (9) High-power magnification of circular band indicated by rectangle in (8). (10) Magnification of ulcer seen in white rectangle in (7). BP, bacterial mass; EX, exudate; U, ulcer; CB, remnant circular band; ER, enamel remains. (11) Magnification of area in rectangle in (10). (12) Magnification of area in rectangle in (11)

called the "annular dental ligament" or the *ligamentum circulare dentis*. He states further that this is entirely incorrect, for no tissues form even a distant resemblance to a ligament and no constricting bands of strong connective tissue fibers exist at the cervical regions of the teeth.

Sicher[11] points out that the *ligamentum circulare* is not a separate organ. In his opinion it does not serve as a barrier to bacterial invasion as the horizontal fibers of which it is composed have spaces between them and normally the epithelial attachment provides the first protective arrangement.

11. Sicher, Harry. Die Weichgewebe des Zahnes und seiner Umgebung. Die Fortschritte der Zahnheilk. 4:262 April 1928.

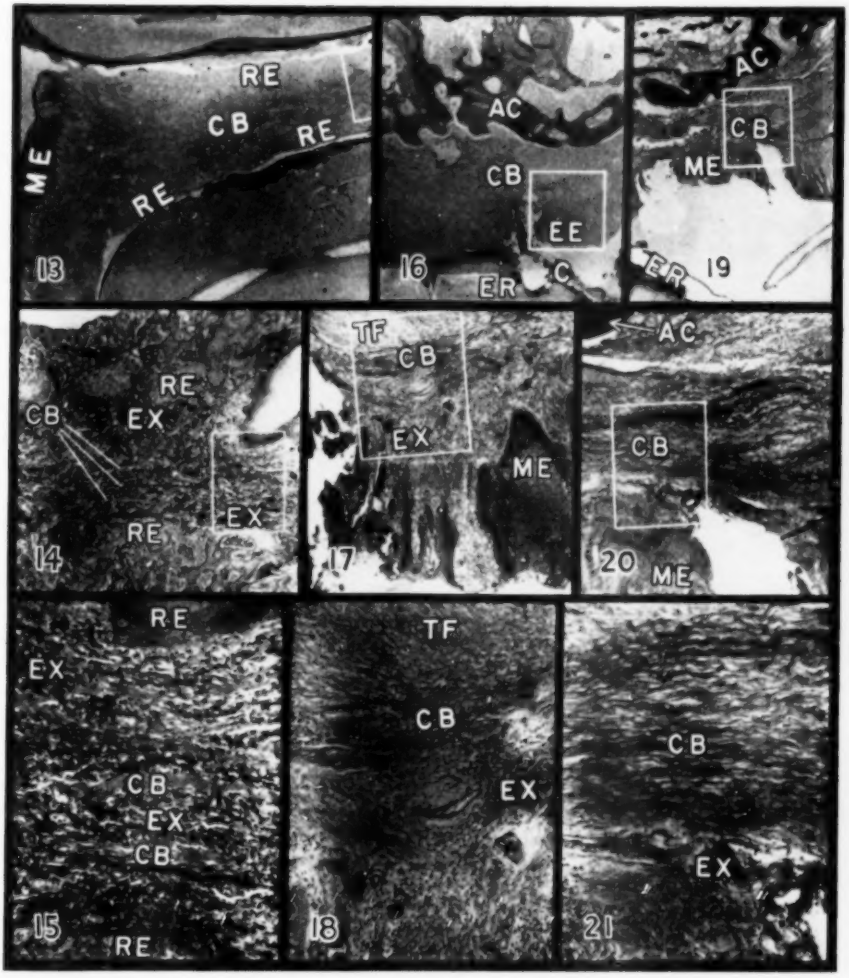

Fig. 3 • (13) Horizontal section, interproximal tissue, upper bicuspids near cervical line, human male, age 56 years, who had had chronic myeloid leukemia. ME, mouth epithelium; RE, root epithelium; CB, circular band. (14) Continuation of area marked in white in (13). EX, exudate. (15) Magnification of area marked in (14). (16) Tangential buccolingual-axial section just mesial to the upper first molar, human female, age 20 years. ER, enamel remains; C, calculus; CB, remnant circular band; AC, alveolar crest; EE, enamel epithelium. (17) Magnification of area marked in (16). TF, transseptal fibers in cross section. (18) Magnification of area marked in (18). (19) Section from same serial as (16) about 300 micra to the mesial. (20) Magnification of region marked in (19). (21) Magnification of region marked in (20)

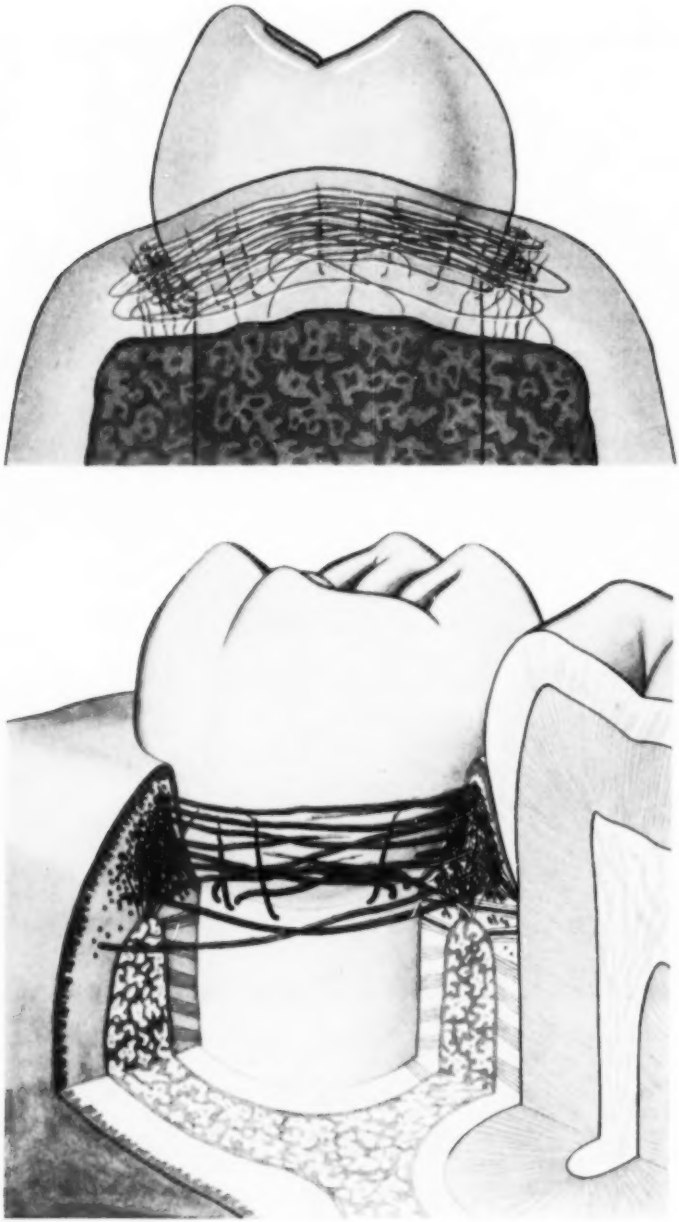

Fig. 4 • Circular band fibers shown in red

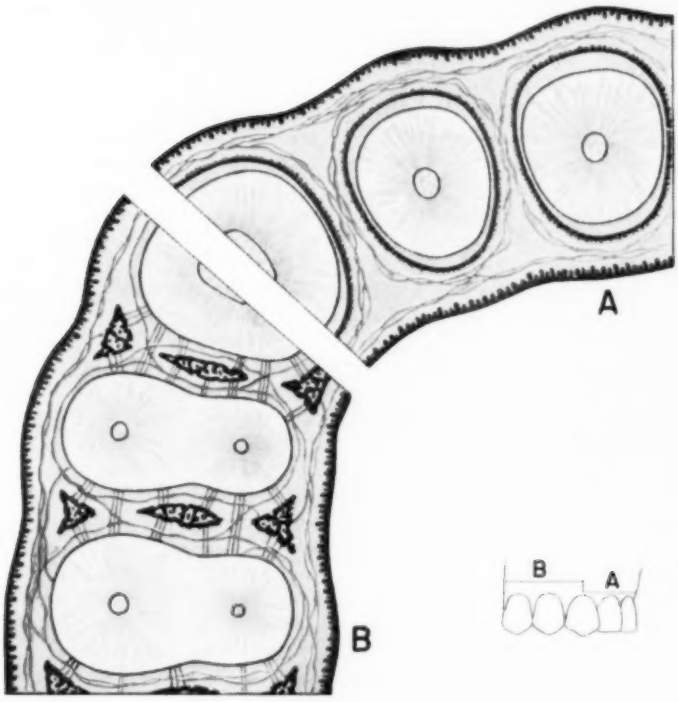

Fig. 5 • Circular band fibers shown in red

In Fish's[3] text on periodontal disease it is said a proteolytic ferment, capable of digesting protein, is released when cells die and particularly when leukocytes are killed and pus is formed. This ferment is thought to be the agent which liquefies the bodies of cells which produce it, and helps to form the fluid form of pus. The ferment also digests the intercellular fibers of the connective tissue surrounding an abscess, ulcer or other septic lesion, causing it to spread and burrow into the tissues. Such a ferment in the simple forms of marginal gingivitis destroys the *ligamentum circulare,* which is the term applied to those collagen fibers which attach the mucoperiosteum to the cementum of the tooth and to the alveolar bone at the gingival margin.

Recent studies by Rushton[12] also fail to provide a description of a circular band of fibers just under the epithelium of the free gingival margin. Ramfjord[13] emphasizes the role of connective tissue regeneration in the healing process.

In an article by Bernier[14] there is a photograph, Number 9, in which the marginal gingiva (90 days after gingivectomy) is revealed in axial section, stained with phosphotungstic acid. The description of this section states that all normal

12. Rushton, M. A. Fibre-structure at the gingival attachment of deciduous teeth. Brit. D. J. 86:105 March 4, 1949.

13. Ramfjord, S. Reattachment in periodontal therapy. J.A.D.A. 45:513 Nov. 1952.

14. Bernier, Joseph L., and Kaplan, Harry. The repair of gingival tissue after surgical intervention. J.A.D.A. 35:697 Nov. 15, 1947.

relationships have been re-established. A notation is made regarding the degree of collagen in the supporting corium which stains as dark irregular strands and islets. This collagenous tissue staining as dark strands and islets is seen to occupy the position of the group of fibers which will be described in the present study as a band encircling the tooth in the gingival margin.

Meyer's[7] circular fiber group, lying within the angle formed by the free gingival and alveolar crest fibers at the cervical portion of the tooth, is without doubt a small part of the band to be described in this study. That such a band exists and that it is not the smallest part of "this fiber group" as stated by Meyer is shown by Bernier's[14] photomicrograph as well as photomicrographs published by Noyes[9] and Meyer. It is obvious from all the articles mentioned that none of the authors saw or realized the physiologic importance of the complete circular band. Most of the fibers in their sections were destroyed by disease, or else the plane of sectioning obscured the band and consequently failed to reveal either its presence or function. Noyes[9] was the only one to suggest the function of these circular fibers.

Any study of the connective tissue fibers of the marginal gingiva would be incomplete without some consideration of the stratified squamous epithelium that covers the margin of the gingiva and clings to the tooth surface. Chambers[15] found by microdissection that cells from the superficial layer of the human epidermis are easily isolated. Superficial cells are horny, the connecting bridges are brittle and break easily so that a little friction will cause these cells to slip off. The deeper cells are bound firmly together by innumerable bridges. They could not be pulled apart directly, but they could be disengaged. The presence of the bridges is to be regarded as a highly specialized modification suited for the peculiar function of the epidermis.

Zeidman[16] found that attached pairs of human buccal epithelial cells could be separated readily by micromanipulation. He determined the force necessary to separate the cells at three different temperatures. At room temperature the force required for 100 pairs of cells was 1.53 mg. with a standard error of plus or minus 0.067.

Coman[17] found that squamous epithelium obtained from scraping of fresh tissues from the normal lip could be separated with a force of 1.42 mg. plus or minus 0.041. Figures obtained for carcinomatous cells are much lower than those of normal cells. In carcinoma of the cervix the cells may be separated with a force of 0.18 mg. plus or minus 0.022.

Toller[18] studied the epithelial attachment in young dogs, using frozen blocks of tissue according to methods adapted to this purpose by Hatton.[19] He estimated the degree of force required to detach the gingiva from the tooth as the technic used did not give dependable, accurate measurements. The approximation of the gingiva to the teeth was dependent on

> . . . a component of two forces, one the elasticity of the gum tissues, and the other the strength of the attachment. In these preparations, as soon as the tension was released on the gingivae, they promptly returned to a position closely hugging the enamel and appreciable force was required for all succeeding separation. . . . Experiments with this material do not justify any great faith in the mechanical effectiveness of the epithelial attachment. It seems, at least to one of us, to be much less significant, than that of the elasticity of the gingivae.

15. Chambers, R., and Renyi, G. S. The structure of cells in tissues as revealed by microdissection. I. The physical relationships of the cells in epithelia. Am. J. Anat. 35:385 July 1925.

16. Zeidman, Irvin. Effect of temperature on the mutual adhesiveness of epithelial cells. Science 109:596 June 10, 1949.

17. Coman, D. R. Decreased mutual adhesiveness, a property of cells from squamous cell carcinomas. Cancer Research 4:625 Oct. 1944.

18. Toller, J. R. Studies of the epithelial attachment in young dogs. Northwest. Univ. Bul., Dental Research and Graduate Study Quarterly, 40:13 Jan. 1, 1940.

19. Hatton, E. H. Structural changes in periapical and other oral infectious processes and their significance. J.A.D.A. & D. Cosmos 24:1749 Nov. 1937.

Baume[20] states, "The way the gingival epithelium is fastened to the surface of the tooth is little understood." He feels tonofibrils of the attached epithelium are in continuity with the primary enamel cuticle and that they are dependent upon the vitality of the epithelial cells for their existence.

The consensus is that all marginal gingivae always contain some cellular exudate, usually referred to as round cells or in greater detail, as lymphocytes, plasma cells and occasionally polymorphonuclear leukocytes. The question has been raised whether the presence of these cells is normal. Cattoni[21] described the presence of lymphocytes in the epithelium of clinically normal gingiva. Bass[22] has expressed the opinion that exudate within the marginal gingiva is an evidence of disease rather than a normal condition. The presence of exudate in relatively large quantity in the marginal gingiva could well account for the absence of most of the fibers in diseased gingiva as Fish[3] has observed. His deductions are in accord with what is taught in general pathology, and the explanation appears reasonable in light of present clinical and histologic studies of this tissue.

METHODS

The material used in this study included 135 human autopsy specimens, 250 white rats and 5 rhesus monkeys. The great majority of the sections were cut in a direction parallel to the long axes of the teeth. The average thickness of the sections ranged from 8 to 16 micra; all specimens were cut serially. The sections were routinely stained with hematoxylin and eosin. Certain sections were stained with Mallory's stain, others were stained with Weigert's elastic tissue stain. The different heights of the buccal, lingual and interproximal gingivae prevent showing the entire circular band in one section.

RESULTS

Study of serial sections of healthy human, rat and monkey tissues reveals the presence of a circular band of dense connective tissue just underlying the epithelium of the margin of the gingiva. This band may be followed in serial sections down to the alveolar crest (Fig. 1-6). The circular band is punctured by and mingles with the fibers of the free gingival group. It almost loses its identity in the papillae just buccal to and just lingual to the interdental space, as there are dense, compact bundles of fibers extending axially from bone and cementum toward the tip of the papillae in this region. This mass of axial fibers makes up the bulk of the interdental papillae on the buccal and lingual aspects of the interdental space.

As the sections approach the level of the alveolar crest in the interproximal area, fibers of the circular band decussate with transseptal fibers (Fig. 3 [17 and 18], Fig. 4 [below] and 6). Along the junction between proximal and buccal or lingual surfaces, near the line angles, some circular fibers are anchored in the cementum. They slant upward and contribute to the bulk of the circular band in the margin of the gum. In addition to these fibers originating from the cementum, others embedded in the alveolar crest bone join the circular band on the buccal and lingual aspects of the tooth. Consequently, the band is much denser, more compact and larger on the buccal and lingual aspects of the interdental space than it is in the space itself. It is firmly anchored to both alveolar crest bone and cementum at the neck of the tooth (Fig. 3 [13-15], Fig. 4 and 5.)

20. Baume, Louis J. The structure of the epithelial attachment revealed by phase contrast microscopy. J. Periodont. 24:99 April 1953.

21. Cattoni, Martin. Lymphocytes in the epithelium of the healthy gingiva. J. D. Res. 30:627 Oct. 1951.

22. Bass, Charles C. Some facts physicians should know about maintenance of dental health. Bull. Tulane M. Fac. 9:12 Nov. 1949.

The readiness with which the band is observed as a unit depends primarily on the direction of cut and health of the gingiva. In diseased gingiva, the fibers are few in number, they are widely separated by cellular and serous exudate, and are difficult to find. This is specially true of the interdental part of the circular band. Presence of injurious material, hair, bacteria or calculus is associated with disintegration of the cells and fibers (Fig. 2, 3, 6). Advanced periodontal disease with systemic complications is accompanied by marked degeneration (Fig. 3 [13-15]).

DISCUSSION

The general acceptance of Hopewell-Smith's[10] contention that no circular band of connective tissue exists in the gum margin probably has its origin in the scarcity of horizontal sections through this region and the dearth of healthy human gingiva. It may also be related to the unfortunate choice of the term "ligament" to denote other bundles of connective tissue fibers at alveolar crest level.

Meyer's[7] deductions that the circular group forms the smallest part of a definite system of fibers found near the gingival border are not upheld by photomicrographs shown in his text. Quite the opposite condition is seen in his Figures 169 and 173. Examination of these photomicrographs of monkey gingiva reveals many islets of connective tissue fiber bundles cut in cross section. The bundles are distributed throughout the derma from the free gingival margin to the cervix. Further study of horizontal sections presented in the present paper reveals that the fibers, cut in cross section by Meyer, actually encircle the tooth.

Bernier's[14] photomicrograph Number 9 also shows islets of connective tissue, in cross section, occupying much more than a small part of the available space in the tip of the marginal gingiva. It is this group of islets that, when sectioned horizontally, shows a circular band. This is further confirmed by study of Noyes'[9] photomicrograph, Figure 222.

Section after section of specimens studied during preparation of the present report reveals the circular band compris-

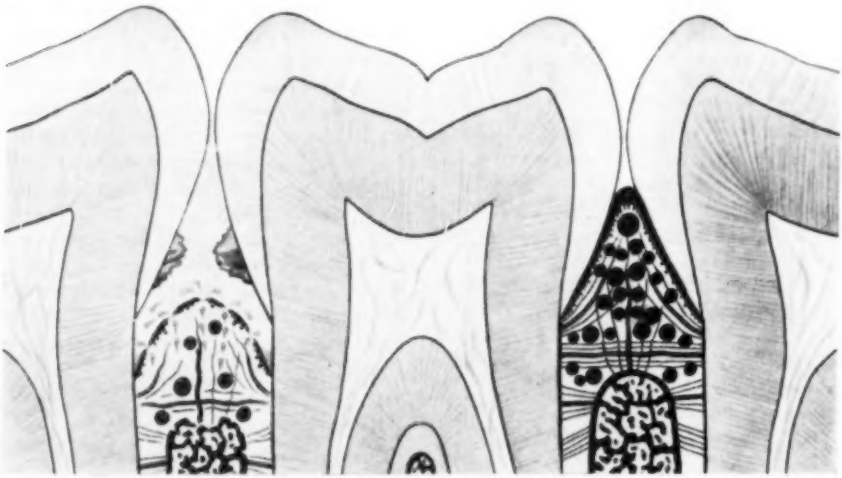

Fig. 6 • Circular band fibers shown in red, diseased and healthy

ing a large part of the fiber system in the gingival margin. No ligaments are seen. The scarcity of lymphocytes, plasma cells and polymorphonuclear leukocytes is noteworthy in these sections of healthy marginal gingiva. There is a noticeable lack of migration of polymorphonuclear leukocytes through the epithelium into the mouth when circular band and epithelium are intact. Few specimens with no evidence of cellular exudation were observed. Enough were seen to warrant serious consideration of Bass's[22] idea that the presence of exudate in this region is the earliest sign of gingival disease.

Much confusion, from the clinical viewpoint, is clarified when it is understood that a strong bundle of circular fibers inhabits the tip of the free gingival margin. This bundle is soon lost when inflammation occurs and it rebuilds when injurious agents are removed. This concept supports accepted and proved clinical practices. It provides a more substantial histologic basis for the relation known to exist between tooth and gingival margin than the highly theoretical hypothesis concerning the epithelial attachment. If one prefers to place greater importance on the epithelial attachment, the presence of a healthy circular band will support rather than refute the concept.

The arrangement of the fibers comprising the circular band points to a significant role in maintaining the tone of the marginal gingiva and its close adherence to the neck of the tooth. In combination with the loose areolar fibers in this region and the enamel epithelium, an architectural pattern is revealed that bars ingress of foreign material or injurious agents. Foregoing data concerning separation of epithelial cells suggest that the epithelium alone is not the important factor in maintaining the health of the marginal gingiva.

With the presence of disease, the circular band fibers disintegrate rapidly and soon lose their identity. The epithelium, having lost its connective tissue support, is partly or wholly separated from the tooth surface. The clinician can readily see, under these circumstances, why tissue tone is lost and why the diseased gingival margin can be blown away from the neck of the tooth with a weak blast of air. Toller's[18] component of two forces, the elasticity of the gum and the strength of the attachment, is decreased markedly.

Understanding of the foregoing provides the strongest motivation for the general practitioner to practice and teach the right kind of mouth hygiene. This knowledge points to the possibility of preserving the health of the gingiva by eliminating injurious agents from the region. It also substantiates biologically that which all good clinicians know; namely, that thorough, careful and complete removal of all injurious agents accompanied by conscientious, regular home care gives excellent results in the treatment of most gingival disease.

As these studies progressed, the authors initiated a series of clinical experiments to test the significance of these observations. The experiments will be described in detail in another paper. The clinical studies give additional evidence that with correct treatment connective tissues regenerate, fibers of the circular band rebuild, and the marginal gingiva readapts itself closely to the neck of the tooth.

SUMMARY

1. Study of serial sections of human, monkey and rat jaws reveals a band of compact connective tissue encircling the teeth within the marginal gingiva.

2. The band in healthy specimens occupies a large part of the available space between alveolar crest and gingival margin. It is soon destroyed, and the remnants are difficult to identify when disease is present.

3. The function of these fibers in maintaining the position and health of the marginal gingiva is discussed.

Periodontics and restorative dentistry

Samuel Charles Miller, D.D.S., New York

Among dentists and dental specialists familiar with the concepts of periodontics and restorative dentistry, there is general agreement on four basic facts in modern dental science:

1. The cause of periodontal disease is known. It is not a single factor but a combination of several factors which may be divided into three main categories, dysfunctional, irritational and systemic,[1] and which combine in varying degrees to produce the disease.

2. Periodontal disease is definitely curable. Teeth that are loose can be tightened, pockets can be eradicated, gingivae can be returned to a firm consistency and pink color, discomforts in chewing can be eliminated, and the teeth can be restored by treatment to such a high degree of health that they can serve successfully as abutments for stationary or removable restorations.

3. Dental prosthetic restorations, both removable and fixed, need not be destructive. The former belief, still lodged in the minds of some patients, that "the tooth to which a bridge is attached will be destroyed" has been proved false by modern dentistry. Contrariwise, properly planned and executed restorations aid in the stabilization and improvement of periodontically involved teeth through more efficient function, division of labor and the effect of splinting. Some of the best examples of bone regeneration are observed around teeth involved in the support of a bridge or around teeth being held by a splint.

4. The texture of healthy and of diseased alveoli varies. Solid bone with its extremely small medullary spaces seems to provide the best support. It is still a question, however, whether durability and comfort would not be served better by a bone structure containing somewhat more organic tissue. Such bony support would be more elastic, would have a better blood supply and would be more capable of resisting injury from stress and infection. On the other hand, an alveolar process which has been considerably demineralized because of a long period of disease, systemic susceptibility or inherited or acquired delicacy of type must be improved by increase in function before it can effectively support added chewing units in the form of bridgework or other prostheses.

THE PROBLEM OF FOCAL INFECTION

In the past a tooth with periapical rarefaction or with advanced periodontal involvement was considered hopeless, and its extraction was advised. At present, few such teeth need to be lost and, as a

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1. Miller, S. C. Oral diagnosis and treatment, ed. 2. Philadelphia, Blakiston Co., 1946, p. 297.

rule, only for one of the following reasons:

1. The systemic health of the patient does not permit conservative treatment. This evaluation must be based on the emotional as well as the physical condition of the patient.

2. A pocket has extended to the periapical area, or a periodontal lesion has involved the trifurcation of a posterior tooth so that the tooth is unsafe for retention even with periodontic treatment. Periodontal lesions involving bifurcations of upper first bicuspids or of lower molars also usually indicate a hopeless prognosis for the particular teeth affected. Such involvement by disease should not be confused with gerontal ulatrophy (senile atrophy), in which the bone and the soft tissue recede at the same rate. Even though the trifurcation or bifurcation becomes exposed through gerontal ulatrophy, the surrounding tissue is just as healthy as tissue around teeth supporting a bridge. In rare cases, usually concerning first molars in which a trifurcation is involved, a gingivectomy may have an effect similar to gerontic ulatrophy.

3. A tooth is involved in a diseased area the removal of which will eliminate the support of the tooth.

4. A tooth is so decayed, worn or fractured that it cannot be restored.

5. A tooth is located so that it interferes with the functioning of the other teeth, with the health of the temporomandibular joint or with the proper construction of a restoration.

6. It is necessary to eliminate oral infections or other oral diseases. If the elimination is impossible without removing the dental unit, then extraction is necessary. General health is the first consideration. Only after hopeless teeth have been removed and the mouth has been returned to health and safety should final and definite plans be made for restorative procedures.

Teeth with periodontal involvement should be given careful attention as possible foci of infection. Accumulating evidence of the past several years shows that periodontal pockets are much more dangerous factors in the production of systemic diseases than periapical abscesses for the following reasons:[2]

1. A much greater zone is involved than in a periapical abscess, considering the total surface area of the walls of all the pockets. It can be stated safely that at least 20 times the absorption surface is involved in an average case of periodontal disease than in a well-developed chronic periapical abscess.

2. Absorption from the gingival sulcus is more rapid since the blood and lymph supply to the gingivae is much greater than to the periapical area in bone, especially when the latter is surrounded by even a slight degree of condensation or encapsulation as is usually the case.

3. Resistance to bacterial growth is lower in the gingival sulcus than anywhere else in the oral cavity because of food accumulation and stagnation.

REPLACEMENT OF EXTRACTED TEETH

All dentists are familiar with the havoc wrought by the early loss of a first molar, especially if the resultant space is not maintained. The shifting of all the teeth to compensate for the deficiency indirectly may be the cause of the loss of all the other teeth, even though such forfeiture occurs gradually over a period of many years. On the other hand, when a tooth is lost in later life and the bone on the adjacent sides of the contiguous teeth is solid, the chances of shifting are considerably smaller and in many cases nil. Though this knowledge can be helpful in decisions on certain specific types of problems, it should still be borne in mind that as a rule spaces between teeth should be maintained. Furthermore, no

2. Miller, S. C. Textbook of periodontia, ed. 3. Philadelphia, Blakiston Co., 1950, p. 685.

teeth should be allowed to remain without antagonists.

In many cases it is better to extract the opposing tooth than to restore the missing member. Although this statement applies especially to unopposed third molars, some important departures from the rule are necessary. An exception should be made when the contiguous second molar is in extremely poor condition, has advanced periapical involvement, is malposed, or has a bifurcation or a trifurcation with periodontal involvement. If the hopeless second molar is extracted and the third molar is brought into function with a stationary bridge attached rigidly to the first and third molars, the opposing second molar is returned to good function; and the unopposed third molar is again in use even though its antagonist is missing.

Of late when the third molars are not in position, it has been the practice to attempt to retain an unopposed second molar by locking the unopposed second molar to its contiguous first molar. Such a procedure is not to be recommended for the following reasons:

1. The opposing first molar must function against two teeth rigidly attached together. Its support usually disintegrates slowly under the added burden so that eventually a partial denture becomes necessary.

2. The splint, even though it retains the unopposed second molar, does not utilize it for increased efficiency of mastication, since this tooth still has no antagonist.

3. Such splinting procedure, if properly executed, requires at least a three-quarter if not a full crown on both the second and first molars so that in biting, the first molar is not forced out of the splint. The loss of efficiency involved in this change of anatomy, no matter how expertly performed, certainly must be considered in the decision.

4. Contrivances of this type cause the patient unconsciously to shift mastication to the opposite side with resultant abnormal wear, loss of efficiency and frequently temporomandibular joint disturbances.

COMPLETE DENTURES

In regard to complete dentures also, there must be agreement on certain factors: First, the maximum efficiency of complete dentures, no matter how perfectly constructed, is only 20 per cent of that of the natural dentition. Secondly, complete dentures function in an abnormal manner no matter how well they are constructed. Alveolar bone is designed to function under tension through the pull of the periodontal membrane, whereas beneath artificial dentures the bone functions under compression.

The fact that many people are satisfied with their complete dentures is certainly a credit to the makers of the dentures. Though many difficulties have been overcome, complete dentures, nevertheless, are still artificial dentures on resilient bases. Some of the credit for the success of complete dentures belongs to the patient who makes at least the following accommodations to the dentures:

In the first place, unconsciously or consciously, he changes his food habits to use materials that can be eaten with the 20 per cent efficiency. Many foods that contain riboflavin and iron—meats, for example—are given a smaller place in the diet. Angular cheilosis due to these deficiencies is much more frequent in denture wearers even when no vertical height has been lost and no local irritating factors are present.

In the second place, the denture wearer makes adjustments to the artificial palate, to the lessened space for the tongue and to the changes in taste and mastication of foods. Even though most of the taste buds are in the tongue, a psychological adjustment is necessary for the taste satisfaction of food and also for its proper

mastication and passage to the pharynx.

Finally, no matter how well the dentures fit, there is resiliency of the soft tissue base, and some give occurs. The psychological effect differs with each patient, but in some it is a matter of considerable importance.

Probably the most difficult problem is the problem of a complete denture for one jaw when all or some natural teeth remain in the opposing jaw. In such a case, the natural teeth, having been relieved of the trauma of opposing teeth imbedded in bone, usually are improved in health and security. The complete denture, therefore, must function by compression at the same time that it receives further injury from the pounding of the rigid opposing teeth. Resorption, peripheral irritation and hyperemia of the denture-bearing area are common in such cases; breakage is a fairly frequent occurrence. Consequently, those who have seen how the resorption of the lower ridge and even of the body of the mandible to the lower border makes the mandible susceptible to fracture rarely, if ever, advise a complete lower denture functioning against natural upper teeth. A slightly better prognosis may be made for a complete upper denture functioning against naturally supported lower teeth, but even then the prognosis is far from favorable. When other factors also are present in such a situation, for instance, interference with the freeway space by an overly built denture and constant grinding by a patient, continual difficulties may be expected.

A point worthy of note is the infrequency of temporomandibular joint disturbances experienced by patients who wear complete upper and lower dentures. The factor which keeps any cusp interferences from irritating the joints is the so-called "REALEFF," a term used by Hanau[3] to denote "resiliency and like effect," that is, the skidding, give, and all other factors that make a denture inefficient. Exceptions occur in the case of concave joints which require an usually steep overbite, a requirement which is certainly not the rule in proper complete denture construction.

THE TEMPOROMANDIBULAR JOINT IN NATURAL OR ARTIFICIAL DENTURES

Though there usually is not a temporomandibular joint problem for the wearer of complete artificial dentures, for wearers of partial dentures and for those who have unrestored teeth and a resulting elongation or shifting of other teeth, temporomandibular arthrogryposis becomes a major problem. It appears that in such cases the cause is rarely loss of vertical height but rather one of the following factors:

1. Unilateral mastication. Lack of efficiency on one side may be caused by missing teeth or the placement of a restoration on that side. The temporomandibular joint pain is usually due to pressure, whereas clicking is almost always due to extension or excessive play of the joint. Thus, on the used side, pain is experienced while on the unusued side, if there are any symptoms at all, the only one is clicking. Extension stationary bridges, because they change the anatomy of the abutments and restore little added efficiency with the pontic, often show such results. When the symptoms are bilateral so that the patient has no choice of masticating side, the joint disturbance is not quite as frequent although instances of bilateral joint pain do occur when both sides are restored by free end bridgework.

2. Disharmony between centric occlusion and centric relation. When the teeth must close and then slide into position for maximum occlusion, as is frequently the case, it is possible that the joints may be displaced sufficiently to cause injury.

3. Swenson, M. G. Complete dentures, ed. 2. St. Louis, C. V. Mosby Co., 1947, p. 12.

3. Excessive overbite. In cases of excessive overbite, either the anterior teeth migrate or the mandible is pushed back on closure with resultant compression of both joints. Such a situation may be brought about by the placement of jackets or other restorations on anterior teeth which are slightly thicker than the original teeth with the result that the patient unconsciously retracts the mandible. Bilateral joint pain is common in these cases.

4. Extensive alteration of occlusion in mouths with a concave, carnivorous type of joint together with a naturally steep overbite and deeply intercuspated type of occlusion. When a flat, herbivorous type of occlusion is established in these cases, clashing with the articular eminence as well as in other directions occurs because of the freedom which is given to a type of joint originally designed for hinge action.

In the treatment of temporomandibular joint cases, two problems have caused most of the rare failures experienced by the author: (1) In the cases in which an extremely concave joint required a return to the carnivorous type of occlusion, it was difficult to find a dentist who was willing to re-establish prominent cusps and an excessive overbite when such therapy was indicated. (2) Those individuals who had suffered with joint disturbance for many years became extremely tense; therefore, the muscle spasms maintained the abnormality even though the functional cause was corrected. Mephenesin, a curare-like drug, is useful in reducing muscular spasms. Even though it is not a sedative, it has a soothing effect; its use gives the patient a general relaxation which helps to dispel any psychogenic tendency.

Treatment for the majority of cases of temporomandibular joint disturbances consists primarily of the elimination of cuspal interferences, the removal of unopposed teeth, the establishment of fairly equal efficiency on both sides of the arch, the harmonizing of centric occlusion with centric relation and, in excessive overbite cases, the establishing of slight leeway so that the mandible can attain a relaxed closure.

TYPES OF ALVEOLAR BONE

Alveolar bone[4] varies in density of trabeculation and thus in its ability to support the tooth. Denser or more closely woven bone with smaller medullary spaces allows a better prognosis than bone with large cancelli, from which less efficient support can be expected. When injurious influences have been induced by external factors such as gingival irritation and traumatic occlusion, the bone is destroyed from above downward as in periodontal disease or marginal atrophy. When there is an internal or systemic factor in action or the external causative factor is severe, the bone dissolves more deeply and wastes away more rapidly as in diffuse atrophy. An analysis of the condition of the bone, based on roentgenograms taken at the time of diagnosis, is an aid to the practitioner in predicting the rapidity of bone destruction and the most probable outcome of any case. The rule to be borne in mind is: Rapidity of bone destruction is in inverse proportion to the uniformity of density of the alveolar support.

According to the "S. C. Miller Classification of Alveolar Bone Types,"[4] there are five phases in the course of bone destruction which can be distinguished roentgenographically: (1) normal alveolar support, (2) marginal thickening of the periodontal membrane line with thinning of the periodontal lamella or lamina dura, (3) arrested bone destruction, (4) slow bone destruction, (5) rapid bone destruction.

It should be remembered in the inter-

4. Miller, S. C. Textbook of periodontia, ed. 3. Philadelphia, Blakiston Co., 1950. Chap. 7.

pretation of roentgenograms that variables in roentgenographic technic, such as roentgen-ray exposure, developing technic, angulation of the rays, and position of the film, may alter the reproduction. The alert diagnostician is able to discount these artefacts and to modify his prognosis accordingly or else to secure other roentgenographic views in order to obtain as true a picture as possible of the condition.[4]

EQUILIBRIUM OF THE INDIVIDUAL TOOTH

Contrary to the procedure in the balancing of occlusion for complete dentures, in the planning for partial restorations or for any appliances, whether fixed or removable, which are to be placed in the mouth when some natural teeth are present, the equilibrium of the individual tooth must be taken into consideration. For each tooth, some relationship must be established between the supporting ability of its periodontium and the amount of stress it receives in function; and furthermore, the stresses must fall close to the circumference of the supporting area or preferably within it. Each tooth should also be in such individual balance that the resultant forces of function do not tip the tooth unduly and cause either inflammatory reactions with susceptibility to pocket formation or migration. The positioning of rests, the choice of abutments and types of attachments, the counterbalancing of forces in partial restorations and the steepness of cusp inclines in relation to age and tissue resistance should all be planned with regard to the individual equilibrium of each tooth involved.

COMMENT

The problems discussed in this article are only a few of the many mutual issues confronting both the periodontist and the prosthodontist, who by sharing experiences in their separate specialties can contribute to each other's advancement.

The Art of Reading • Read not to contradict and confute; nor to believe and take for granted; nor to find talk and discourse; but to weigh and consider. Some books are to be tasted, others to be swallowed, and some few to be chewed and digested: that is, some books are to be read only in parts, others to be read, but not curiously, and some few to be read wholly, and with diligence and attention. *Francis Bacon.*

Magnets to stabilize dentures

Hyman Freedman, D.D.S., New York

Despite the progress made in prosthodontics, much remains to be done before both dentist and patient are wholly satisfied. Most dentists are constantly investigating new, different and presumably better methods of constructing dentures. And far too many patients gravitate constantly from dental office to dental office in an effort to obtain more satisfactory service. Probably the time will never arrive when all dental prosthetic problems will be solved completely, but in the meantime, the best minds in the profession will be turned toward its solution. Embedding small but powerful magnets in the molar region of dentures is another method devised to overcome prosthesis instability, a problem which Joshua Greenwood attempted to solve with spiral springs.

In providing a full upper or lower denture, a dentist is expected to fabricate a structure which is to be placed on a foundation that is neither rigid nor uniformly yielding. He must place that denture so exactly that it will mesh precisely with an opposing denture. Moreover, it must be stabilized in the presence of, and despite the interference of, the movable tissue that is continually trying to dislodge it. Not only must the base be firm, it must be seated comfortably on the tissue; the patient must never be conscious of this foreign object in his or her mouth. Discomfort to the patient generally is accompanied by atrophy or pressure which causes the underlying ridge to change more rapidly than it would normally.

The difficulty of this problem is indicated by the radical methods some men are adopting to serve the edentulous patient. Without attempting to evaluate the merits of the procedure, implant dentures must be considered a radical procedure. Men are resorting to it only after the conventional technics fail to produce dentures that patients can wear confidently and comfortably. The use of magnetized dentures may be termed a radical procedure, but it is a procedure that can be evaluated, and its worth can be proved without difficulty to the patient or the dentist.

BASIC PRINCIPLES IN PHYSICS

The principle that like poles repel is familiar to everyone from early experience in physics. Everyone has seen the principle at work in toys and novelties. Now by the use of small magnets built within opposing dentures, like poles are made to oppose each other. The result is repulsion. The upper denture pushes the lower one away from it, and the lower pushes the upper away. This repulsion keeps both dentures in place (See Fig. 1-4).

The degree of repulsion is a moderate one, not enough to make a patient unduly conscious of its presence. Pressure on the lower denture increases as it

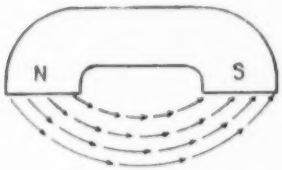

Fig. 1 • The line of force from the north to the south pole of a magnet strives continuously to complete the circuit despite resistance offered by air gap between its poles

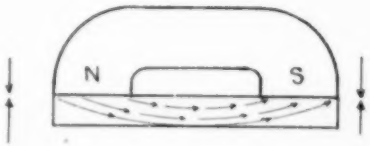

Fig. 2 • Passage of the lines of force is facilitated by the metallic "keeper." This "keeper" conducts the force from the north to the south pole, jumping the air gap resistance. This is the principle of simple magnetic attraction

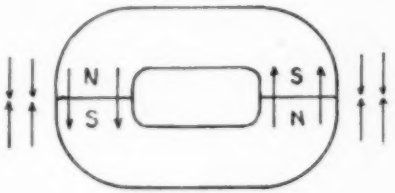

Fig. 3 • If the distance between the north pole of one magnet and the south pole of the other is less than that between the pole ends of the same magnet, the lines of force prefer to go to the other magnet. In this way the force meets less air resistance. The result is an intense attraction of the two magnets

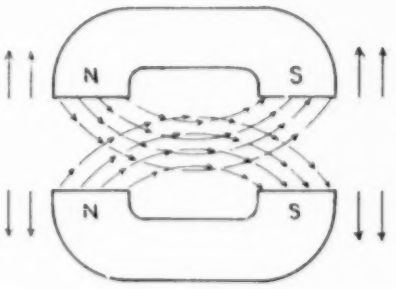

Fig. 4 • Note the cushion of repulsion that is caused when like poles oppose each other. When these magnets are employed in dentures, this repulsion is intensified as the mandible compels the lower magnets to occlude with the upper. Here again, as in Figure 1, the lines of force try to traverse the air gaps of their own magnet to avoid the unnatural interference that is offered by like poles

approaches the upper denture and diminishes as it moves away. As the mandible brings the lower denture into occlusion, the repulsion is overcome. In the act of overcoming that repulsion, however, the denture is settled on the underlying foundation. In the conventional technic, when there is a poor ridge foundation to guide the position of the denture, the tongue, cheeks and lips are hindrances to stability. With magnetized dentures they actually serve as walls along which the magnetic influence gently leads the denture to the ridge.

ADVANTAGES GAINED BY USE OF MAGNETS

The results that are now enjoyed when conventional methods of stabilizing dentures are used are improved when magnets are added. The retention of dentures through the magnets is relatively constant, and this retention is not affected by the regressive changes which affect peripheral seals. Moreover, the stabilizing force

Fig. 5 • The convexity of the yoke of the magnet fits neatly into the concavity of the ridge at the bicuspid-molar region

is positive. Each closure actively although gently settles the dentures.

This kind of retention is a new experience for the denture wearer. The most that could be achieved by the use of conventional technics was the stabilization of the dentures by conforming the tissue-borne surface of the denture to every minute irregularity in the underlying foundation. Although the need for this high degree of accuracy is not minimized by magnets, retention is enhanced or improved by using another surface of the denture as a definite factor in retention, the occlusal surface. Through the insertion of magnets in the occlusal surface, retention is obtained when the denture is guided to place on the ridge.

The magnets employed in this technic are of a special alloy and were developed with the assistance of the General Electric Company. They are permanent magnets. The curved magnet is employed because experience has demonstrated that this form is far more efficient than a straight magnetic bar which promptly weakens and then attracts instead of repelling.

The curved or yoke form of magnet stores power better and yields a more concentrated impulse at the pole ends and repels indefinitely. With little modification this form of magnet is adaptable to the space available for its insertion in dentures. The convexity of the yoke fits neatly into the concavity of the ridge in the bicuspid-molar region. The pole ends do not extend beyond the occlusal surface (Fig. 5 and 6).

PERFORMANCE OF MAGNETS

There are certain precautions to be observed in the use of the magnets. For one thing, they must not oppose each other exactly. The direct opposition of the magnets causes the lower denture to be pushed out of the mouth. Also direct repulsion is erratic. Repulsion must be controlled and directed (Fig. 7).

Controlling and directing the force of the magnets proved to be the greatest problem encountered in their application. The topography of the lower edentulous ridge also was a tremendous obstacle. Generally the mandibular ridge is low anteriorly because it is there that the greatest resorption takes place. The ridge rises somewhat in the bicuspid region and dips down again in the six year molar region and then rises sharply toward the retromolar pads.

Because of this arrangement, the stress exerted in mastication can cause the denture to slide forward. The anterior lingual portion of the mandibular ridge helps to minimize this forward drift in some in-

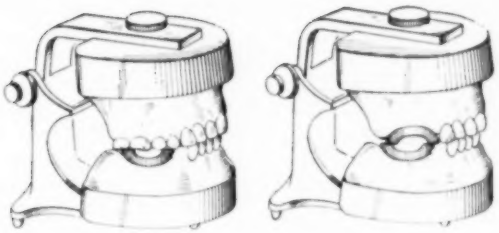

Fig. 6 • The pole ends do not extend beyond occlusal surface. Lower right bicuspids and molars have been removed from the try-in. Note the manner in which upper magnet is articulated to lower. The convex side of magnet always should be placed toward the cheek (Fig. 7)

stances. In just as many instances the lingual portion of the ridge is too low and sloping, and there is no existing pressure at that point to hold the denture down. As a consequence many patients wearing dentures acquire a protrusive position of the mandible. This may be caused by an instinctive desire on the part of the patient to bring the lower anterior teeth out of contact with the upper teeth, or it may be a defensive mechanism to circumvent the forward movement of the denture by anticipating it with a voluntary forward movement. Although this action may give the patient a sense of security, the acquired centric position is hard on the subsequent denture maker. He has the serious esthetic problem to overcome in eliminating the pugnacious appearance of the patient. He also has the functional problems which become more serious because of the temporomandibular joint difficulties that may be caused by that protrusion.

These are the observations that indicated the need for a controlled and directed magnetic force, a repulsive force that would attach the denture to the ramus as well as to the body of the mandible.

When like polarized pole ends of opposing magnets do not coincide exactly, a diagonal or lateral repulsion is exerted at the same time as the vertical repulsion. If, for instance, the lower pole ends are directly behind the upper, the force is directed downward and backward on the mandibular denture. More than that, there is, because of this placement of pole

Fig. 7 • Left: Note standard mesiobuccal overlap of the upper (shaded pole ends) over the lower pole ends. Arrows indicate inward and backward influence of upper magnet on lower when it is properly overlapped. Right: The exception that is employed for cross-bite cases. Note mesiolingual overlap of upper magnet over lower pole ends

ends, a diminished over-all repulsion because the metal does not contact metal squarely. The farther back the lower magnet is placed in relation to the upper, within limits, of course, the more decided the distal push at the expense of the vertical push. By placing the lower pole ends some 2 mm. behind the upper, a repulsion is obtained when the teeth are in centric relation which steadies the lower denture in a downward and backward position. This repulsion overcomes the forward and upward drift of the lower denture.

As they are now employed, the upper magnets overlie the lower buccally and mesially. As the result of the upper buccal overlay, the lower denture is kept within the confines of the upper denture—it is not pushed out to the cheek. The mesial overlay of the upper magnet causes the mandibular denture to adhere to the ridge and ramus and to resist the tobogganing effect induced by the arch-shaped molar slope. As the lower denture attempts to creep forward, the lines of repulsion direct it downward and backward and set up a force that resists this movement of the denture. Thus the upper denture fences the lower in to keep it from straying; magnets which exactly overlie each other fail in this respect. It is most vital for magnet pole ends to show through the occlusal surface so as to be able to check the proper overlaying at all times. Concealed magnets are not only feeble, being farther apart, but useless for proper positioning.

The effectiveness of this force is easy to demonstrate, even in those instances where there is little trace of a lower ridge. In such a case, when both dentures are in place, if the lower denture is lifted with a pointed instrument, it is possible to feel it glide back on being released.

Not only is the stability of the lower denture affected by this repulsive force, the downward and backward pressure on the lower denture is accompanied by an upward and forward pressure on the upper. The problem with the upper denture is not as serious. Fortunately the upper denture is well stabilized, covering as it does a large area and having a vault to keep the denture from moving forward. The lips and cheeks also act as bands to seal the denture.

"Are patients conscious of this repulsive force?" is a question that is frequently asked. The experience of hundreds of patients has been most favorable. They know a force is being exerted with each closure, but they are no more conscious of that force than a person who is wearing a pair of well-fitted gloves. The sense of security that a patient feels with magnetic dentures is comparable to that which he would enjoy with fixed restorations.

While it is true that repulsion increases as the dentures come closer, it is actually diminished when the teeth are in centric relation because of the method in which the magnets are overlaid. It must be remembered that because the magnets do not coincide directly, the force is reduced considerably. When the lower denture goes into eccentric position, repulsion accordingly increases.

When the lower left pole ends are 2 mm. lingual to the upper left pole ends, the lower denture tends to push to the right. The same condition on the right side pushes the denture to the left. When the mandible moves from a rest position to right eccentric position, there is more repulsion encountered on the right side, for the pole ends on that side are closer to coinciding. This is desirable because when the jaw is in an eccentric position there is more chance of the denture's tipping. However, the increase in force is not as great as it would seem. The patient is aware that food not yet crushed is bulky. When the mandible passes from rest position to the beginning of the chewing stroke, the patient must clear that bulk of food to eliminate the possibility of tipping the denture before the food reaches it. Instinctively the gap is

wider before the beginning of one chewing stroke than after it is completed. A wider opening diminishes repulsion and makes the lateral increase less noticeable. The intermittent and variable pressure of repulsion which keeps the dentures snugly in position is specific and salutary. There has been no instance of undue ridge resorption.

The weight of the denture is not increased perceptibly through the use of magnets. Although the magnets weigh more than the equivalent amount of denture-base material, there is so small an amount of alloy used that the added weight of the denture is not a factor.

EXPERIENCES WITH MAGNETIZED DENTURES

The results obtained with magnetic dentures are a contrast to the usual experience. When dentures are made with conventional technics, no matter how carefully executed, failures are all too frequent. The original retention of the denture is dependent on a great many factors beyond the control or the help of the operator, such factors as tissue resistance, character of saliva, muscular habits and tolerance of the patient. Even under the most favorable conditions, too many dentures soon lose their original efficiency for no apparent cause.

Still, following the conventional procedures no one apparently has difficulty in obtaining an initial fine peripheral seal on a complete lower denture. Every dentist has had the pleasure, when testing the peripheral seal, of practically being able to lift the patient out of the chair, and all operators have been disappointed when the same denture failed in function. The numerous cross leverages exerted on moist yielding tissue in mastication, the unconscious dropping of the tongue to a low level or the shift of the lip release the seal on the denture and cause it to rise from the ridge. After a few such experiences, the patient, in defense, learns to relodge her dentures in place. Too often patients pound the lower denture down in the hope of establishing a seal that will function in conversation and in eating.

Experience has proved all too often that it is impossible, after the completion of denture service, to make an accurate prognosis—to foretell what the experience of the patient will be. Frequently it is not until many weeks later that the areas of irritation develop under the denture. Then begin the guessing and the trimming. It is difficult to locate the areas of the denture that are causing irritation. Even the finest disclosing paste spreads, and relief must be made in the denture while the surrounding tissues are still puffy from the hurt. An operator can never be sure how much or how little of the peripheral seal should be cut away.

The permanence of the peripheral seal is always a problem. Metabolic changes in a patient will change a denture that had been satisfactory into a source of endless trouble. Adequate peripheral seal is impossible in instances where the angle of the rami is more obtuse than 90 degrees, in mouths with flabby mylohyoid muscles that have a great range of movement, in mouths with dry tissues or with loose membranes or short lingual frena. In view of all this, it would seem that a radical or a new approach to the problem of the peripheral seal is long overdue. To those who are ready to employ new methods, it will be most reassuring to learn that magnets protect the peripheral seal despite contrary conditions.

The peripheral seal, as every dentist knows, is not the only source of difficulty in denture work. Suction is another problem. Here again magnets are of assistance. Whenever suction is lost, the magnets will place the dentures snugly back on the ridge where they belong. Because the force of repulsion does not permit the denture to leave the ridge for any distance, the chance of the false seating is

Fig. 8 • When magnets are reduced so as to adapt them to requirements of ridge, the pole ends are shortened, not the yoke

greatly diminished. The force of repulsion is not nearly as intense as that of suction. With well-fitting cavosurfaces, with borders conforming to flexion lines, with labial and buccal thicknesses to hold the denture against corresponding vestibular surfaces, magnets are simply another asset in the stabilization of the dentures. Repulsion applied to the one remaining surface of the denture, the occlusal surface, completes the cycle of retention.

It is not only in the field of complete dentures that the use of magnets is appropriate. They are equally helpful in the construction of tissue-borne palatal and lingual bar restorations. With this type of appliance, magnets have proved so effective that in many instances clasps have been removed and the stability and retention have not been impaired.

The use of magnets in repulsion should not be accompanied by any sacrifice of conventional method. The better a denture is made, the more repulsion will augment its excellence. If magnets are used to compensate for a faulty technic, they will fail to achieve the desired results.

REACTION OF PATIENTS

The reaction of the hundreds of patients who are now wearing magnetic dentures has been favorable. The following single case history is presented as an example. In the case to be described the dentures were constructed under the direction and observation of several well-known denture authorities. The purpose of this test case was to determine whether noticeably better results were obtained when magnets were used than when conventional methods were used.

Impressions were made in the usual manner with a broad base and upturned heels on the lower denture. No mention was made to the patient that magnets were being considered for his restoration. When the dentures were first provided, the complete upper denture had no magnets. Therefore, the magnets that were inserted into the lower denture were not active.

The inert upper denture was an exact copy of the magnetic upper denture that was supplied at a later date. The original set-up was copied as was the degree of opening, and the centric relation was maintained.

After a moderate amount of adjusting and spot grinding, the patient was dismissed with the magnetic lower denture and the nonmagnetic upper denture. He was instructed to return in a week. On his return he stated that he was comfortable and getting along fairly well.

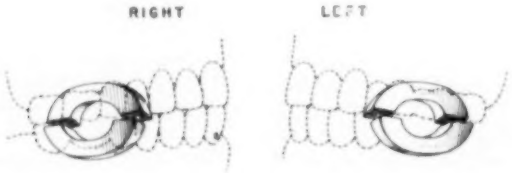

Fig. 9 • Upper magnet is placed distal to the cuspid. The lower denture is articulated to the upper, and consideration must be given to necessary mesiodistal and buccolingual overlap

Fig. 10 • Above: Waxed case with magnets separated from teeth to show how they are inlaid. Below, left: Right side, buccal view. Note how teeth have been cut and inlaid against magnets. Below, right: Right side, lingual view. Note how teeth have been cut and inlaid against magnets

Unknown to him, the magnetic upper denture was placed in position with the magnetic lower denture, but at this time the upper magnets were inert. The patient again was dismissed and on his return he stated that he was still enjoying satisfactory results. His sole remark referred to the presence of metal in the teeth of both dentures. He appeared to accept the dentures with the inert magnets as part of the service.

Without the knowledge of the patient, the upper and lower dentures were charged or magnetized, and the patient again dismissed with instructions to return in ten days. On his return this time he indicated that he felt a definite improvement in the stability of the dentures. The patient was still unaware that the dentures had been magnetized or that such a service was possible. At this visit, final adjustments were made on all three dentures. The patient then was asked to make a selection between the upper denture containing the metal inserts and the one without. Surprising as it may seem, the patient found fault with the lower denture while using the inert upper one and blamed the difference on the upper. He inferred that the denture without the metal was no good. With this remark, his interest in the upper denture ceased. Since he was not informed that magnets had been used in either the upper or the lower denture, he was not aware of the purpose in alternating upper dentures and could not tell the exact reason for rejecting the inert upper denture. He simply insisted on retaining the upper and lower dentures with the metal inserts.

After he had worn the dentures with the metal inserts another two weeks, the patient again was recalled. At this time the dentures were demagnetized without telling the patient and returned to him, and he was dismissed with instructions to return if he had any further difficulty. He returned in a matter of days, and he was considerably disgruntled. He complained that his dentures had been ruined by the last adjustment. At this time he refused to wear the dentures, claiming that they were so unsatisfactory as to cause him an endless amount of trouble. Immediately after being provided with the remagnetized dentures, his comments were favorable.

This patient was evidently satisfied

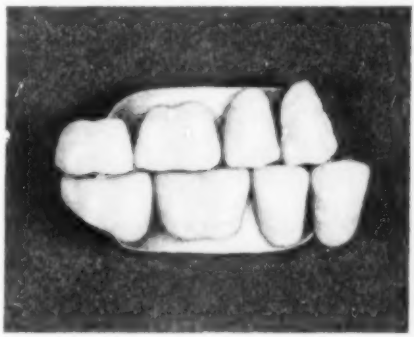

Fig. 11 • Buccal view of bicuspid-molar section of the try-in. Wax was removed to illustrate the relation between teeth and magnets

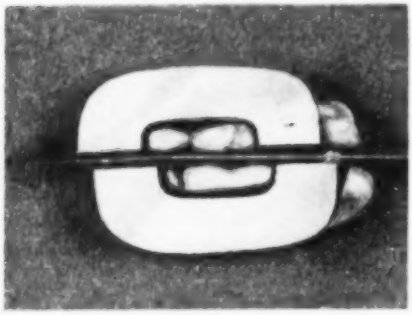

Fig. 12 • Lingual view of bicuspid-molar section of the try-in. Note how acrylic teeth have been cut to provide space for magnets. The magnets are separated to emphasize inlaid relationship

with dentures that had been constructed according to conventional procedures. He returned home with those dentures, came back for an examination and expressed satisfaction. It wasn't until after he had been introduced to magnetized dentures that he became critical. Because he had enjoyed the stability made possible by the force of repulsion, he was no longer content without this additional aid.

Fig. 13 • Denture completely waxed. On right side of try-in the teeth have been separated from magnets to show how magnet is inlaid against remaining portion of acrylic tooth

After a lapse of eight months this patient was recalled. He was extremely satisfied with the dentures. The lower denture had not crept forward, there was no visible opening between the occlusal planes posteriorly, and the tissues were in good condition.

When the patient was asked if he would permit roentgenograms and photographs to be taken of the restoration, he readily agreed, provided we would not again tamper with the magnetism in his dentures.

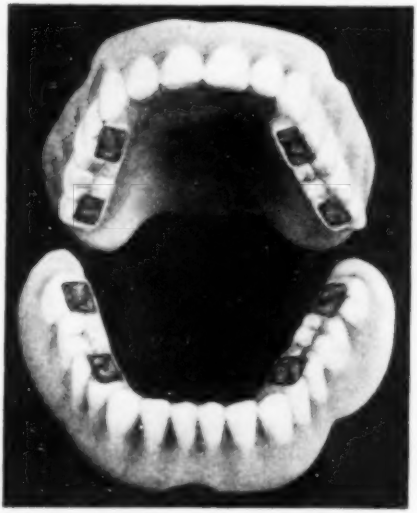

Fig. 14 • Finished restoration. Although acrylic teeth have been employed with these magnets, porcelain teeth are applicable. The disadvantage of porcelain is its friability when it is altered. Metal pole ends of the magnets serve to maintain vertical dimension

In a demonstration before the First District Dental Society, the difference between magnetized and nonmagnetized dentures was proved in a matter of minutes.

Small peanut butter sandwiches were provided several patients. The patient was permitted to eat half the sandwich

wearing dentures which were magnetized, and the other half was eaten with the same denture demagnetized. The results showed in two ways: First, as far as the patient was concerned, the lower dentures, when magnetized, felt firm and seemed to be an integral part of the underlying ridge. The patient ate comfortably and confidently. Second, the difference also was noticeable to observers. The magnetized dentures remained in a fixed position on the ridges. The occlusal surface drew itself out of the bolus of food with the efficiency of a toffee-pulling device.

When the dentures were demagnetized, the patient's reaction was one of disappointment. Because these patients were accustomed to magnetized dentures, they had forgotten the various rescue movements employed by most denture patients. As a result, they were embarrassed and refused to proceed with the demonstration. Visually, the demagnetized dentures were uncontrollable and showed plainly that they had to be relocated with each masticating stroke.

SUMMARY

Through the employment of magnets that repel, new stabilizing force increases the serviceability of dentures. The force of repulsion is alive, resilient, permanent. The force of repulsion is directed and controlled. The upper denture forces the lower denture down and back on the ridge. The lower denture repels the upper denture which prevents disaster when the peripheral seal is broken.

The technic is simple (Fig. 8-14). The best conventional procedures are employed for taking the impressions and for establishing the vertical and centric relations. The insertion of the magnets in the denture is a procedure that can be entrusted safely to any technician who is familiar with their placement.

Hundreds of dentures have been made in the last 19 years, and the results are such that the procedure is recommended with confidence to every dentist who is desirous of improving his service to the edentulous patient.

200 West Fifty-eighth Street

Human Resources • There were about 200,000 fewer deaths in our country in 1950 than would have occurred if the death rate of 1945 had continued unchanged. This is an outstanding achievement in life conservation for so brief a period and is attributable largely to the rapid advances in medical science, the steady rise in the general standard of living, and improved safety measures. If the mortality of 1945 by age, sex, and color had prevailed in 1950, the year would have seen almost 1,657,000 deaths, in place of the 1,452,454 actually recorded. *Statistical Bulletin 34:4 March 1953.*

Auxiliary uses of cold-curing acrylic resins in prosthetic dentistry

William L. McCracken, D.D.S., M.S., Birmingham, Ala.

Methyl methacrylate, the polymerization of which is induced by chemical activation only, has been identified by varied terminology. The term "autopolymer" is actually a misnomer, inasmuch as any polymerization is an automatic phenomenon, which occurs spontaneously under certain conditions.

In all methyl methacrylate polymers used in dentistry today, there is present a small percentage of a peroxide catalyst. This peroxide is broken into free radicals by heat, which catalyzes the polymerization reaction. The addition of a chemical, usually a tertiary amine, to the liquid monomer makes it possible for the peroxide to be liberated as a catalyst without the addition of heat. Therein lies the difference between heat-cured and cold-cured acrylic resins. It seems most logical, therefore, to speak of this newer method as a cold-curing process.

For several years cold-curing acrylic resin has been subjected to critical analysis as a filling material and more recently as a denture base material. Its future as a permanent filling material is still somewhat controversial. There are factors of thermal change, retention and discoloration which must be overcome if the material is to satisfy the requirements of a permanent direct filling material. The requirements for a satisfactory denture base material are entirely different from those for a direct filling material. Acrylic resin denture bases have been used and accepted for more than 14 years; the basic requirements for the cold-cured resin remain unchanged.

Some of the faults of the cold-cured materials which have been listed up to the present time are: (1) bubbles and porosity, (2) slight color instability, (3) free monomer content, (4) poor retention of solvent-resistant teeth, (5) aging or weakening due to the effect of chemical components and (6) slightly less hardness and strength.

Many of these faults have been completely overcome or eliminated by improvements within the past year or two. There seems to be little doubt that improvements will continue until all of these have been eliminated as deterring factors.

Among the advantages of the cold-cured resins, one cardinal asset seems to stand out, that is, greater accuracy and permanency of form. Laboratory testing and clinical experience seem to bear out this observation. Sample testing has shown also that hardness and strength are within acceptable limits.[1] Clinically,

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1. McCracken, W. L. An evaluation of activated methyl methacrylate denture base materials. J. Pros. Den. 2:68 Jan. 1952.

a tougher denture base seems to result from a cold-curing process, and fewer fractured dentures are reported. The continued use of the cold-curing resins in prosthetic dentistry seems to be assured.

COLD-CURING RESIN AS AN IMPRESSION TRAY MATERIAL

Prior to the introduction of the cold-curing resins, the use of individual impression trays made of heat-cured acrylic resin had become accepted in partial denture and complete denture technics. It was natural that the newer materials should be adapted to this use with satisfactory results. At every dental meeting today interested groups gather around the commercial booths where such trays are being demonstrated. Most of these materials have been compounded to make the fabrication of individual trays as simple as possible.

These finger-formed trays have many disadvantages, some of which are inaccuracy and lack of uniformity in thickness; but they still serve well the purpose for which they are intended. A more accurate tray of uniform thickness may be made by the sprinkling method described in this paper; however, it requires more time to make one by this method.

THE PRINCIPLE OF CEMENTATION

It has been shown by Nealon[2] and others that a cold-curing acrylic filling may be placed without pressure by the direct application of polymer and monomer. It is now generally accepted that by adding the wetted particles in increments, less dimensional change due to curing shrinkage results.

This is still considered a partial polymerization process, although it has not been proved satisfactorily that partial polymerization is what actually takes place. It is possible that there is instead a bonding of polymer particles which have been made tacky and cohesive by the addition of activated monomer. Kelly[3] has proposed the term "cementation" for the bonding of polymer particles when wet and made cohesive by cold-curing monomer.

It is an accepted fact that at ordinary temperatures cold-curing acrylic mix of monomer and polymer proceeds rapidly to polymerize in a given time, depending on the percentage of activator used. This process is accelerated by heat and retarded by cold.

There is also present in cold-curing polymer some free peroxide which breaks down and catalyzes the polymerization even without the penetration of the monomer into the polymer particles. Therefore, some polymerization must occur; it seems possible, however, that the otherwise unchanged polymer particles are actually bonded together by a matrix of polymerized monomer, just as the particles of silica and alumina are held together by a gel matrix in a silicate cement filling. Such a process would account for the lesser dimensional change in the painted-on filling without a deleterious decrease in strength and in other physical properties.

IMPRESSION TRAYS MADE BY A SPRINKLING-ON METHOD

The sprinkling-on method in the making of acrylic trays and baseplates has been highly successful. The method consists of the following steps: Primary impressions of the patient's mouth are made with the material of choice. Any undercuts in the resulting primary cast are blocked out with wax or with modeling clay, and a film of wax is flowed over the crest of the ridge. The cast is then painted with an alginate foil substitute, preferably one which brushes on smoothly.

2. Nealon, Frank H. Acrylic restorations by the operative nonpressure procedure. J. Pros. Den. 2:513 July 1952.

3. Kelly, E. Byron. Rapid polymerization and cementation in denture construction. J. Pros. Den. 2:491 July 1952.

As soon as the film of alginate has dried on the cast, approximately a third of the area to be covered is wetted with cold-curing monomer from a medicine dropper; and enough polymer is dusted onto the wetted surface to absorb the liquid. Monomer is again applied to the area, and again it is lightly dusted with polymer. This procedure is repeated a third or a fourth time before it is started on another segment of the tray. In the making of a lower tray, it is best to form the posterior third on either side first and the anterior third last.

In the beginning it is not advisable to add an excess of liquid to the partially formed tray, for the entire mass may flow away from the higher ridge crests and cause excessive peripheral thickness. Equal care must be taken with an upper tray to avoid an undesirable thickness. After the entire area has been covered, further wetting and sprinkling are done where necessary to add thickness over the ridge and to equalize the over-all thickness of the tray.

The making of acrylic trays in this manner is facilitated by the use of a two-ounce dropper bottle for the liquid and a widemouthed bottle of similar size for the powder. A single hole 2 or 3 mm. in diameter is made in the lid at the edge to facilitate pouring. The bottles should be uncontaminated and preferably purchased new from the drug store. The bottle of foil substitute and a small brush for applying it to the cast complete the armamentarium needed.

The tray thus formed is set aside for 20 to 30 minutes. If no undercuts are present, the tray is lifted without warming. Usually, however, it has been necessary to wax out some undercuts. In that case the tray is immersed in water sufficiently warm to soften the wax before its removal is attempted. Much of the wax adheres to the inside of the tray and is scraped out before the tray is seated back on the cast. The tray is then trimmed and made ready to try in the mouth for further adjustments prior to the taking of the final impression.

The accuracy and reproduction of detail obtained by this method are such that some operators may prefer to use a spacer of definite thickness in lieu of a thin film of wax flowed onto the model. This spacer, which may be left in while adjustments to the periphery are made, is peeled out just before the final impression is taken.

In the past, proponents of partial denture impressions made to functional ridge form have been confronted with the difficulty of obtaining a functional impression prior to the making of a metal-base casting. When acrylic saddles are to be used, functional impressions are made with the cast framework used as a carrying medium for the impression waxes; but if the casting is to be a one-piece structure, the making of metal saddles to functional ridge form necessitates the correction of that portion of the master cast before making the metal casting.

Applegate[4] has shown that cast bases may be made to the functional form of the ridge tissue and suggests the assembling of these bases to the rest of the structure by soldering. Now, however, Applegate prefers the acrylic tray method in order to avoid the soldering operation or the assembly of the base, cast separately and then united by means of acrylic resin.

Recently this problem has been successfully solved by the utilization of an acrylic tray made with three definite occlusal stops to assure the seating of the tray with equal accuracy in the mouth and on the master cast. Hall[5] and Applegate are credited with developing this technic whereby a reinforced resin tray is used to accomplish the support of the impression material. The use of cold-curing acrylic resin as outlined in this

4. Applegate, O. C. The cast saddle partial denture. J.A.D.A. & D. Cosmos 24:1280 Aug. 1937.
5. Hall, W. A. Unpublished paper.

article seems to accomplish the same result in a less complex manner.

The master cast or an accurate study cast may be used for the fabrication of the tray. The ridge area to be corrected is covered with one thickness of 28 gauge wax. The remainder of the cast, with the exception of three widely spaced occlusal seating areas, is blocked out with modeling clay. A trough of baseplate wax is added anteriorly to provide a form for the tray handle.

The three occlusal stops are painted lightly with foil substitute, which is permitted to dry. The saddle area is first wetted with monomer and then sprinkled with polymer, and the process is continued as previously described. An upper cast is treated in the same way as a lower cast, without any palatal coverage.

The finished tray should be of uniform thickness, somewhat greater than that for a full denture tray, and should have a handle which projects over and beyond the incisal edges of the anterior teeth. The tray should not contact the teeth at any point other than the three occlusal stops.

The tray is set aside for 30 minutes or longer; then it is removed and the excess trimmed away. After that it is ready to carry back to the mouth where it should seat accurately on the three occlusal legs in the manner of a tripod. The fluid-wax functional impression is made of the ridge areas. The impression is then carried back to the master cast for the repouring of the saddle areas.

It was mentioned previously that the tray may be formed on an accurate study cast instead of on the master cast. This can be done only if the study cast is made with the same care as is taken in the obtaining of a master cast. It is a fact too often ignored that for accurate diagnosis and effective treatment planning, any study cast should be an accurate reproduction.

An accurate study cast may be blocked out with clay and the impression tray formed upon it. This tray should seat with equal accuracy both in the mouth and on the master cast for the correction of the saddle areas. It provides an excellent opportunity for checking tooth movement between the taking of the two impressions. The three occlusal areas can be corrected in the mouth with a mix of self-curing acrylic resin before the final impression is taken.

Any changes in tooth form, such as the preparation of occlusal rest seats and guiding planes, will be subtractions rather than additions and should not interfere with the seating of the impression tray, if the three seating areas have been selected with the design of the appliance in mind.

If possible, the appointment for mouth preparations should allow for the making of the wax functional impression in the previously prepared tray and the taking of the final hydrocolloid impression for the master cast. Mouth preparations are completed first, then the wax functional impression of the ridge area is made, and finally the hydrocolloid impression of the anatomical form of the teeth and adjoining structures is taken.

Prior to the pouring of the hydrocal master cast, the saddle areas to be recorded in their functional form are blocked out with stainless steel matrix material and left unpoured. After the separation of the master cast from its impression, the acrylic tray with its completed wax impression is seated on the cast and attached to it securely with sticky wax. Next the saddle areas are poured. The resulting master cast, complete with corrected saddle areas, is then ready for the construction of either an acrylic or metal-base partial denture without further referral to the patient until such time as the occlusal relationship is to be established.

The many advantages of metal-base partial dentures are ignored only because of the technical difficulties that have been encountered in the past. The advantages

of the sprinkled-on tray make possible improvements in technic, coupled with economy of chair time, which may serve to bring the metal base back into its rightful place as the best base in partial denture service.

ATTACHING TEETH TO METAL SADDLES

After the metal casting has been completed and the occlusal relationship established by the method of choice, the partial denture is ready for the occluding of the teeth and for their attachment to the metal saddle. When a resin is to be used to attach the teeth to the saddle, the cold-curing acrylic resin may be preferable because it eliminates the need for flasking.

The occlusion is perfected and the final waxing is done with the framework seated on the master cast, from which it is not removed throughout the following procedure. Microfilm or some other colorless separating medium is applied to the exposed parts of the master cast. Two hydrocal matrices are made for each saddle area where teeth are to be attached. The lingual matrix is made first and carried over three fourths of the occlusal surfaces of the posterior teeth. The buccal or labial matrix is made next, with about 1 mm. clearance left between the two. These matrices are then removed and their opposing edges trimmed. This procedure provides for a visual check on the position of the teeth during processing.

The teeth are removed from the wax, and all the wax is flushed away with hot water. The metal saddle and the teeth are cleaned with some detergent, but no organic solvent is used. The teeth are then attached to the lingual matrix with sticky wax, and the surfaces of both matrices are painted with foil substitute.

The cold-curing acrylic resin may be handled in one of two ways. Either the sprinkling method may be employed; or a mix of the acrylic resin in proportions of three to one, the same as for other denture bases, may be used. In either case, the recess and retention provided for on the metal base are wetted with monomer before the acrylic resin is placed.

The acrylic resin is placed from the buccal or labial side and pressed to place with the buccal or labial matrix. Some retaining force is necessary, since it is impractical to use digital pressure for the length of time required. Therefore, a "C" clamp or a similar instrument is placed over the two stone matrices to hold them for a period of 20 minutes. With one side held by a clamp, any other areas may be prepared similarly.

The denture is set aside for a minimum of 20 minutes, after which the finishing process may be completed. Because of the retarding effect of foil substitutes on the surface of the acrylic resin, however, it is best to defer polishing until the surface of the acrylic resin has been exposed to the air for a period of time. Surface hardness increases rapidly once the matrices have been removed, and polishing within an hour after their removal is permissible.

The elimination of flasking operations in other phases of partial denture construction may be possible. The principles involved in the cold-curing technic will probably make possible further modifications of present technics.

BASEPLATES AND TRIAL BASES

The successful use of sprinkled acrylic resins for impression trays has naturally led to their use as baseplates and trial bases in complete denture construction. The difference lies in the purpose for which they are intended.

For baseplates which are to be used later as stabilized bases for registering jaw relations, the utmost accuracy is desired. For trial bases also stability is essential. Therefore, only the areas of under-

cuts are blocked out with wax or clay; and maximum tissue contact is provided for, particularly over the bearing areas. Deep depressions between the rugae also are filled in to prevent abrasion of those areas of the cast. The cast is painted with foil substitute, and a baseplate is formed in the same manner as for an impression tray but of less thickness.

After the baseplate is removed from the cast, any peripheral excess is trimmed off and the wax rim is added. The resulting base will be of such accuracy that the actual amount of retention of the denture may be determined at this time. This same base may be used later to mount the tracing device for registering centric and eccentric jaw relations.

This same base may be used as a trial base on which to set the teeth, although the ease with which a base is formed makes the use of another base preferable.

In the making of an upper trial base, only the palatal area is covered on the cast; and a tissue-thin layer of acrylic resin is carried over the ridge crests. The labial and buccal flanges of the trial base are completed in baseplate wax because the accuracy of the ridge areas assures its stability in the mouth. The lower trial base is made as thin as possible over the crest of the ridge with only enough peripheral thickness to assure its stability in the mouth. After the final try-in, waxing and investing are completed as usual. The acrylic base is removed from the flask by boiling-out, and the trial base is discarded.

The simplicity of fabrication, coupled with advantages of greater accuracy and stability, makes the sprinkled-on acrylic base more gratifying to use and adds a certain precision to the construction of complete dentures that has not been possible in the past.

IMMEDIATE DENTURES

Sprinkled cold-curing acrylic impression trays may be used wherever individual trays are used and with advantages over previous methods. They may be made for immediate denture trays to suit the requirements of the technic being used.

For an alginate hydrocolloid impression, the tray may be sprinkled while on a study cast, which has been blocked out with clay to the desired clearance of teeth and periphery. With a handle added and perforations made in the tray, an ideal individual impression tray is prepared.

For a sectional technic or modifications of it, a tray may be made which can be muscle-trimmed and corrected with one of the impression pastes.

Trial bases for the posterior teeth can be made easily which as trays are superior in accuracy and which make possible the accurate registration of jaw relations on a stable base. The anterior teeth can be added to the base, and the appliance can be waxed with a predetermined palatal thickness assured on the finished appliance.

SUMMARY

The accuracy with which anatomical detail may be reproduced, the strength and dimensional stability of even extremely thin sections, and the simplicity of application make the sprinkling-on method of using cold-curing acrylic resins applicable to many phases of denture construction.

In the construction of complete dentures the cold-curing acrylic resins may be used for the making of: (1) individual impression trays for full denture impressions, (2) individual impression trays for immediate denture impressions, (3) baseplates for biterims and jaw registrations and (4) trial bases.

In the construction of partial dentures they are used for: (1) the making of individual impression trays for alginate hydrocolloid impressions, (2) the making of impression trays for the correction of saddle areas to functional form, particularly if the partial denture is to have

a metal base, and (3) the attachment of teeth to a metal saddle.

Other possible uses of cold-curing acrylic resins, either by compression molding or by a sprinkling-on method, include: (1) the making of temporary partial dentures to be used as immediate replacements while appliances of a more permanent nature are being constructed, particularly if missing anterior teeth are being replaced; (2) the making of orthodontic appliances, such as Hawley retainers and Johnson shields; (3) the replacement of fractured denture teeth and the repair of prosthetic appliances; (4) the making of surgical splints, for example, for the retention of paste dressings after a gingivectomy.

CONCLUSION

The fact that methyl methacrylate polymers can be made to bond without the addition of heat and pressure has opened up new possibilities for the improvement of denture technics.

Two distinct processes are involved. When the activated liquid is mixed with the catalyzed polymer and handled with the same care as heat-curing acrylic resin, the results are comparable and highly satisfactory. Present-day cold-curing materials judiciously used provide denture bases that are highly acceptable as to strength, hardness and other physical characteristics. Accuracy, dimensional stability and toughness are greater than in heat-cured acrylic resins.

When the polymer is sprinkled on a surface which has been wetted with cold-curing monomer and then polymer and monomer are applied alternately until the desired bulk has been obtained, a product results which has acceptable characteristics for limited uses, for instance, for impression trays, baseplates and temporary appliances. Without the application of pressure, a type of cohesion occurs, which has been described as a "cementation," or bonding, of the polymer particles by a matrix of polymerized monomer. There is a lack of density and probably of strength which limits this product to temporary uses.

Research • Research is a high-hat word that scares a lot of people. It needn't. It is rather simple. Essentially, it is nothing but a state of mind—a friendly, welcoming attitude toward change. Going out to look for a change instead of waiting for it to come. Research, for practical men, is an effort to do things better and not to be caught asleep at the switch. The research state of mind can apply to anything: personal affairs or any kind of business, big or little. It is the problem solving mind as contrasted with the let-well-enough-alone mind. It is the composer mind instead of the fiddler mind. It is the "tomorrow" mind instead of the "yesterday" mind. *Charles Kettering.*

Microstructure of dental amalgam

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Past research on dental amalgam has been primarily concerned with the effect of methods of manipulation of amalgam on the physical properties of the hardened material. With the exception of Gayler's work,[1] little investigation of the chemical reactions that occur during the setting of amalgam has been attempted. For example, the reactions that cause the expansion of amalgam during hardening and the factors which influence the amount of this expansion are not known. Nor has the actual mechanism of the attack of mercury on the alloy been determined. It was believed that light could be thrown on these factors by a study of the microstructure of amalgam.

Because of the high mercury content of hardened dental amalgam and the relatively low temperatures at which the amalgam begins to melt (60 to 65°C.), considerable difficulty has been experienced in the past in obtaining information on the microstructure of this material. The purpose of this investigation was to develop methods of preparation of amalgam specimens from which data on microstructure could be obtained.

EXPERIMENTAL PROCEDURE AND RESULTS

Commercial dental amalgam alloys having a nominal composition of 69 per cent silver, 26 per cent tin, 4 per cent copper and 1 per cent zinc were used in this investigation. A sample of commercial amalgam alloy ingot was first polished and etched by immersion in an aqueous solution of 0.2 per cent sulfuric acid and 0.2 per cent chromic acid. This procedure developed the Widmanstätten structure shown in Figure 1 which served to identify the alloy in its subsequent forms. Particles of commercial alloy were then mounted in Bakelite, polished and etched in the same manner as the ingot. The structure of the alloy particles is shown in Figure 2. The Widmanstätten structure is again present.

The alloys were mixed with mercury in a mortar and pestle according to the directions of the manufacturer. Specimens for examination were prepared by pressing the freshly mixed amalgam into disks approximately 17 mm. in diameter and 2 to 4 mm. in thickness in a steel mold. The load applied to the mold was varied from 10,000 lbs. to 500 lbs. to give specimens of known mercury content ranging from 30 to 50 per cent by weight. After the disks had hardened at room tempera-

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1. Gayler, M. L. V. Dental amalgam. J. Inst. Metals 60:407, 1937.

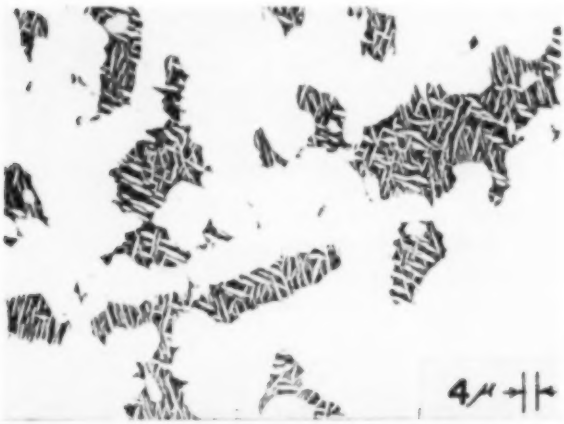

Fig. 1 • Commercial amalgam alloy ingot, showing Widmanstätten structure. No mercury present. Etched in 0.2 per cent chromic acid and 0.2 per cent sulfuric acid

Fig. 2 • Commercial amalgam alloy particles showing Widmanstätten structure. No mercury present. Etched in chromic acid and sulfuric acid

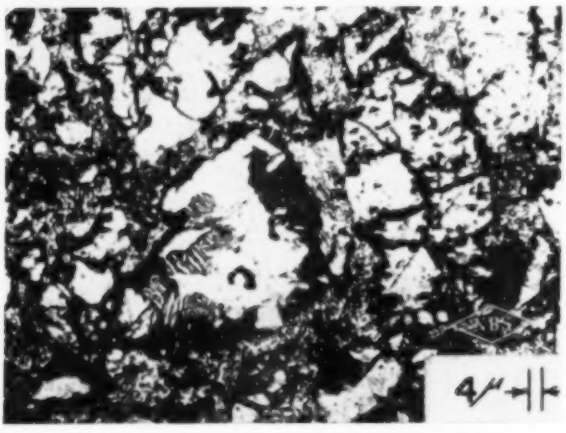

Fig. 3 • Dental amalgam showing Widmanstätten structure present in alloy particle remnants. Electrolytic etch followed by chromic acid and sulfuric acid etch

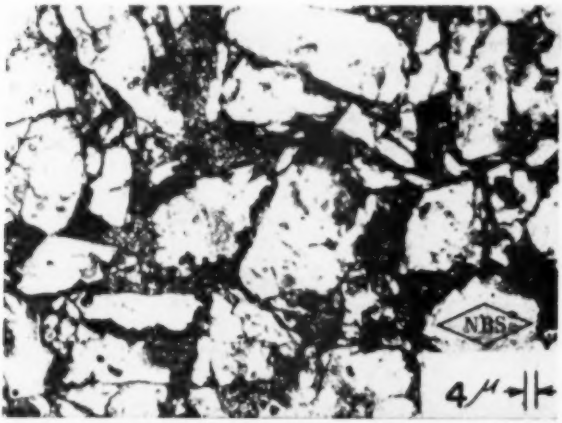

Fig. 4 • Dental amalgam containing 30 per cent of mercury by weight. Etched in 30 per cent nitric acid solution

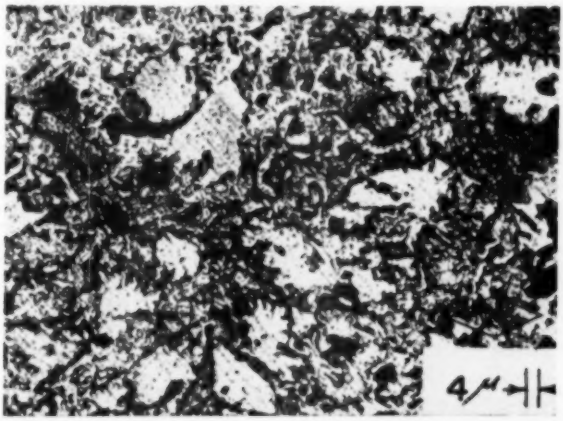

Fig. 5 • Dental amalgam containing 48 per cent of mercury by weight. Electrolytic etch

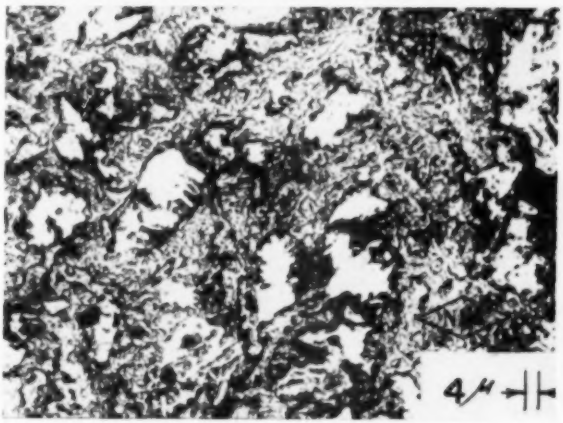

Fig. 6 • Dental amalgam containing 51 per cent of mercury by weight. Electrolytic etch

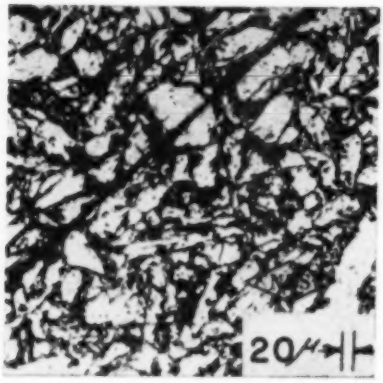

Fig. 7 • Relative hardness of components of dental amalgam as shown by a scratch hardness test. Etched in 30 per cent nitric acid solution

ture, they were mounted in self-curing resin for convenience in handling during the subsequent polishing procedure.[2]

A conventional metallographic polishing procedure employing successively finer abrasives was used. The amalgam specimens were given a preliminary grinding with number 400 Aloxite paper, followed by number 1/0, 2/0 and 3/0 emery paper, in that order. The final polish was accomplished using abrasives in water suspension on cloth-covered laps rotating at low speed (250 rpm). Number 600 Alundum and three successively finer grades of aluminum oxide[3] were used on canvas-covered and satin-covered wheels, respectively. Polishing was carried out under light pressure for short time intervals, and the laps were generously lubricated with water to minimize surface flow and heating effects.

The amalgam was etched by two methods. The first method was electrolytic, using a Cenco Hangosky electrolytic polishing and etching machine. The electrolyte used was the standard nonferrous electrolyte supplied with the equipment. A current density of about 5 amperes for one to two seconds gave a satisfactory etch. After the electrolytic etch, the amalgam specimen was given a secondary etch in the chromic and sulfuric acid solution to reveal the Widmanstätten structure in the white islands present in the structure of the amalgam (Fig. 3). It was felt that this procedure identified the white islands as remnants of the original alloy particle, and in subsequent experiments the secondary etch of chromic and sulfuric acids was not used; hence the Widmanstätten structure is not revealed.

The second method of etching of hardened dental amalgam was by immersion in a 30 per cent nitric acid solution. The time required in the nitric acid solution to reveal the structure of the amalgam seemed to be dependent on the mercury content; the higher the mercury content, the longer the time required to develop the structure. This would indicate that the thickness of the disturbed surface layer was greater for amalgams of higher mercury content, thereby requiring a longer time in the etching reagent for its removal. The results of this procedure (Fig. 4) show a structure similar to that which was developed by the electrolytic method of etching.

The mercury content of the amalgam has a definite effect on the appearance of the structure obtained. The structure shown in Figure 4 is that of an amalgam containing 30 per cent mercury by weight. In this specimen the alloy particles were retained essentially in their original size and shape while the amount of matrix material has been minimized. The specimen whose structure is shown in Figure 5 has a mercury content of 48 per cent by weight. The amount of matrix material has been increased, and the alloy particle remnants show evidence of attack

2. Smith, D. L. Room temperature mounting of metallurgical specimens. NBS Tech. News Bull. 34:31 March 1950.

3. Rodda, J. L. Preparation of graded abrasives for metallographic polishing. American Institute of Mining & Metallurgical Engineers, Transactions 99:149. 1932.

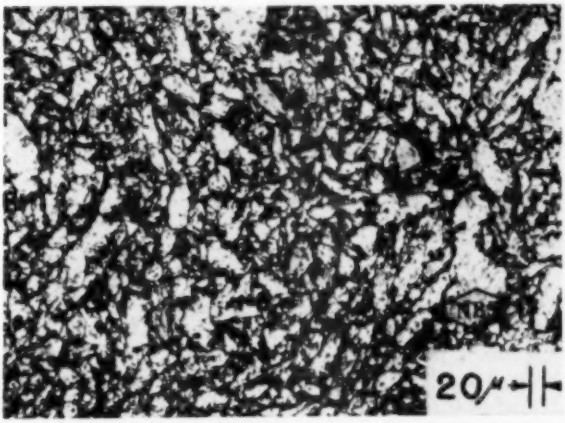

Fig. 8 • Dental amalgam triturated for 10 seconds in mechanical amalgamator. Etched in 30 per cent nitric acid solution

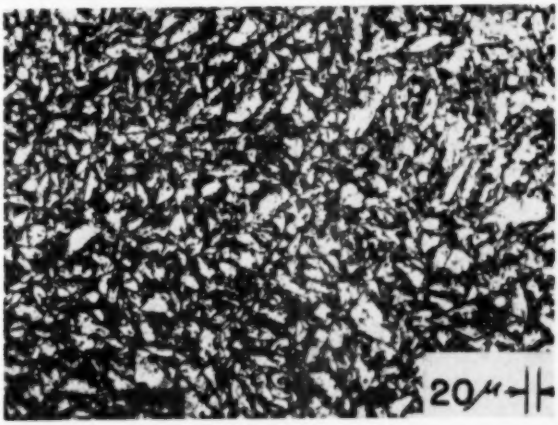

Fig. 9 • Dental amalgam triturated for 45 seconds in mechanical amalgamator. Etched in 30 per cent nitric acid solution

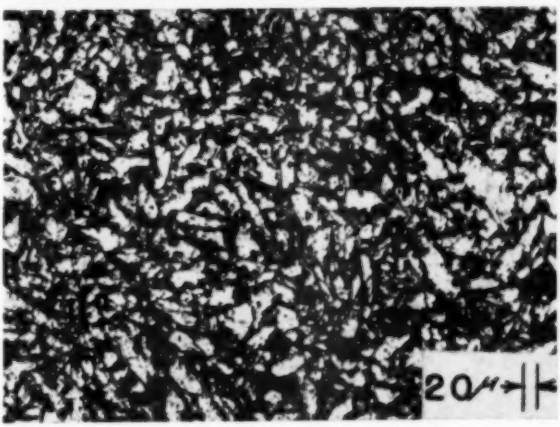

Fig. 10 • Dental amalgam triturated for 90 seconds (45 seconds alloy alone, and 45 seconds with mercury) in a mechanical amalgamator. Etched in 30 per cent nitric acid solution

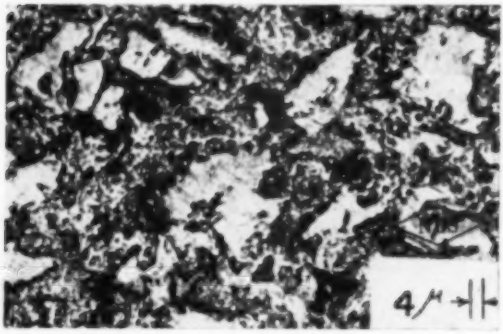

Fig. 11 • Dental amalgam prepared entirely by dental technic. Etched in 30 per cent nitric acid solution.

by mercury. Figure 6 is the structure of an amalgam containing 51 per cent of mercury by weight. The larger alloy particle remnants are rather badly eroded and widely spaced, and the amount of the matrix material has been increased.

The relative hardness of the two constituents of the dental amalgam was determined by a scratch hardness test in which a diamond point under a light load was moved across the surface of the specimen. The results of this procedure are shown in Figure 7. The width of the line across the alloy particle is considerably less than the width of the same line in the matrix materials, indicating that the matrix is softer than the alloy particle remnant.

The observations showing the reduced size of the particles and the increased amount of the softer matrix material in the specimens containing a higher mercury content are in agreement with data[4] showing that high flow values and low strength are associated with amalgams having a high mercury content.

The amount of trituration has been known to affect definitely the degree of expansion that a dental amalgam undergoes during setting. The following procedure was employed to determine the effect of trituration on the structure of the amalgam. The amalgam was mixed in a mechanical amalgamator. Under-triturated specimens were obtained by a 10-second trituration of relatively large mixes. A trituration time of 45 seconds was used to produce over-triturated specimens. A third technic was used in which the alloy was triturated alone for 45 seconds, after which the proper amount of mercury was added to the capsule and trituration continued for another 45 seconds. The results of these tests (Fig. 8, 9 and 10) show that the variation in particle size is not great. The samples which were triturated for a total of 90 seconds show a slightly smaller alloy particle size than those which were triturated for shorter periods. These results indicate that, although the variations resulting from altering the trituration time do affect the dimensional change of amalgam, they do not have an appreciable effect on the appearance of the microstructure of the amalgam.

The structure of an amalgam mixed in a mortar and pestle and packed by dental hand instruments is shown in Figure 11 for comparison with the specimens packed by machine. The structure of hand-packed specimens is similar in appearance to that of machine-packed specimens containing 48 per cent and 51

4. Phillips, R. W., and Boyd, D. A.: Importance of the mercury-alloy ratio to the amalgam filling, J.A.D.A. 34:451 April 1, 1947.

per cent mercury, Figures 5 and 6 respectively.

SUMMARY

Two procedures were developed for revealing the microstructure of dental amalgam. The first, electrolytic, and the second, by immersion in a 30 per cent solution of nitric acid. Both procedures gave essentially the same results. Variations in the mercury content of the amalgam affected the appearance of the structure appreciably, whereas variation of the trituration time did not. The hardness of the alloy particle remnants in hardened amalgam was found to be relatively higher than the matrix material.

The adaptation of modern instruments and increased operating speeds to restorative procedures

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Seldom has an innovation in dental procedures received such widespread attention as the introduction of high speeds with specially designed diamond instruments and carbide burs for restorative procedures in dentistry. Since the early part of the nineteenth century, rotary tools of various types have been used by dentists for the purpose of abrading or cutting away tooth structure. The dental bur in its present form was first introduced during the last century and since that time has undergone little change. In recent years, however, dentistry has been keeping abreast of advancements in the technical sciences by adopting more effective instruments and improved methods for penetrating enamel and for shaping cavities in tooth surfaces.

Regardless of modifications in the methods of making cavity preparations, the basic principles of cavity preparation do not change. Any technic or procedure that might result in the violation of long-established fundamentals should be given no consideration. Furthermore, in a practical science such as dentistry, a new idea cannot be evaluated by laboratory investigation alone; it must stand also the test of clinical application. Therefore, only those instrument designs and technics which incorporate the fundamental safeguards have been investigated, and these have been developed and tested for the purpose of increasing the speed and efficiency with which teeth may be prepared to receive restorations.

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Until recently little has been known about the relationship between increased operating speeds and the many other factors involved in cutting tooth structure. During the past few years investigations have been conducted at the University of Michigan, School of Dentistry, on the physical and mechanical characteristics of rotary instruments under varying conditions. Peyton, Henry and Vaughn reported on the results of studies on the relationship between temperature rise, speed and pressure;[1-3] on the effect of speed on cutting efficiency;[4, 5] and on vibration characteristics of rotary instruments.[6] Walsh and Symmons presented studies recently on heat production and mechanical efficiency of diamond instruments, stones and burs used at extremely high speeds[7] and also on vibration perception and frequencies.[8, 9] The cutting efficiency and heat production of carbide and steel burs were compared by Lammie[10] in a recent publication. The effect of air and water coolants in the control of frictional heat was discussed by Peyton and Henry,[5] Henschel[11-13] and others.[14, 15]

TESTING OF SPEED AND INSTRUMENTS

To determine the practicability of employing rotary instruments at high speeds for routine operative procedures, it is necessary to consider problems of a physiological as well as of a mechanical nature. For the past five years at the University of Southern California School of Dentistry, a clinical investigation has been conducted of such fundamental problems as instrument control, reaction of the patient to noise and vibration, a comparison of cutting efficiencies, methods for controlling temperature rise, the adaptability of various instrument designs, and the standardization of technics.

Instrument Control • Some of the hazards anticipated in operating with rotary instruments at increased speeds have not become a reality. On the contrary, clinical experience has demonstrated that rotary instruments are more readily controlled at higher speeds than at lower speeds of rotation. Whereas an instrument of the disk type has a decided tendency to wedge and jump at low speeds, this tendency diminishes progressively as speed is increased, since the efficiency of rotary instruments increases as the rpm is raised.[5, 7, 10] Furthermore, less pressure on the instrument is required to attain a maximum cutting efficiency at higher speeds.[7]

The direction of rotation of instruments of the disk type is another important factor in instrument control. Insofar as possible, a disk should always be rotated away from the principal point of support and should be drawn into the structure being cut. The use of supplemental finger rest support is always ad-

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7. Walsh, J. P., and Symmons, H. F. A comparison of the heat production and mechanical efficiency of diamond instruments, stones, and burs at 3,000 and 60,000 R.P.M. New Zealand D. J. 45:28 Jan. 1949.

8. Walsh, J. P., and Symmons, H. F. Vibration perception and frequencies. New Zealand D. J. 45:106 April 1949.

9. Walsh, J. P., and Symmons, H. P. Vibration perception in teeth during cavity preparation. New Zealand D. J. 44:39 Jan. 1948.

10. Lammie, G. A. A comparison of the cutting efficiency and heat production of tungsten carbide and steel burs. Brit. D. J. 90:251 May 15, 1951.

11. Henschel, C. J. Heat impact of revolving instruments on vital dentin tubules. J. D. Res. 22:323 Aug. 1943.

12. Henschel, C. J. Pain control by cold control. D. Digest 47:444 Oct. 1941.

13. Henschel, C. J. Pain control through heat control. D. Digest 47:294 July 1941.

14. Lawton, F. E. The control of frictional heat in cavity preparation. Brit. D. J. 83:75 Aug. 15, 1947.

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visable during any operation with either rotary or hand instruments. Injury to adjacent tissue usually occurs as a result of operating with instruments held in a "free-floating" manner without support. A firm finger rest position, proper direction of rotation, and visualization of the cut to be executed before the instrument is engaged against tooth structure are essential safeguards during any operation with rotating instruments.

Patient's Reaction to Speed • There is no doubt that the impact of cutting instruments against tooth structure is a major source of pain and discomfort; however, it is also true that noise and vibration of the motor, the engine arm pulleys, the belt, and the handpiece are also constant sources of the patient's apprehension and nervousness which in turn cause fatigue for the operator. In a study of vibration characteristics of cutting instruments at speeds of approximately 1,600 to 10,000 rpm, Peyton and Henry[5] reported the amplitude of vibration at the handpiece to be greater at a speed between 3,000 and 6,500 rpm than at any other speed. These experiments indicated that certain operating speeds would be more effective than others for transmitting vibrations to the region of operation. According to Walsh and Symmons,[8] the vibrations produced by handpieces rotating up to 5,000 rpm are close to the range of maximum vibration sensitivity in the teeth. These authors are at present investigating the practicability of redesigning equipment used for cavity preparation so that it can operate at speeds which would produce vibrations above the frequency threshold of vibration perception by the patient. In preliminary experiments, an air turbine drill rotating at speeds above 40,000 rpm was used. In view of the many physiological and mechanical problems to be investigated, a considerable length of time will perhaps be required to determine the practicability of operating at such extreme speeds.

In the present clinical study, high speeds of 18,000 to 25,000 rpm were used. Although the apprehension of the patient tends to lessen as speeds are increased above a range of 6,000 to 7,000 rpm, a great deal depends on the condition of the equipment used. It is useless to attempt to employ high speeds if the dental handpiece and other items of equipment are not in excellent condition. In the opinion of the observers, there are two principal reasons for the more favorable reaction of most patients to operations performed with rotary instruments at high speeds: one is the fact that much less pressure is required on the instrument to attain cutting efficiency; the other is the more favorable impression produced on the patient because of the rapidity with which an operation can be completed.

Operating Speeds and Efficiency • Both laboratory and clinical evidence indicates that an increase in speed produces a pronounced increase in the efficiency with which a rotary instrument removes tooth structure. It was reported by Peyton and Henry[5] in their study on speeds and cutting efficiencies of rotary type instruments that for each increase of 2,000 rpm, up to 8,000 rpm, the efficiency of a no. 557 bur was approximately doubled when a constant applied force was maintained. In a more recent report[3] on studies of speeds up to 18,000 rpm, it was indicated that this rate of increase in efficiency was maintained rather consistently for the higher operating speeds. Walsh and Symmons in a study of the cutting efficiency of diamond instruments and stones at an extreme range of speeds reported that stones and diamond instruments remove enamel approximately three times as fast at 60,000 rpm as at 3,000 rpm and at 1/30 of the pressure.

From clinical observation it appears that while the efficiency of diamond instruments increases proportionately to any increase in rpm, the same increase is

not maintained for the dental bur. There seems to be a range of speed at which the efficiency of the bur begins to decrease. This observation is borne out also by the work of Peyton and associates, who suggest that the most effective operating speed for the bur may be in the region of 9,000 to 12,000 rpm.[3,6] It is likely that changes will be made in the present design of dental burs which will increase the cutting efficiency of these instruments at greater speeds of rotation.

Effect of Coolants • Considerable evidence can be found in the dental literature emphasizing (1) increases in temperature produced by rotary instruments during cavity preparation and (2) effect of excessive temperature rise on vital tooth tissues. For many years Henschel[11] has advocated the use of a stream of water as a coolant to control pain and trauma due to frictional heat during the preparation of cavities. Peyton and Henry[5] reported recently that rotating instruments may be operated safely without a coolant at speeds up to 4,000 rpm with an applied force of 1 pound or less, that, however, an increase in either rpm or work load beyond these limits may produce a temperature rise of sufficient intensity to be a possible source of pain and even of injury to vital tissues of the teeth. In these studies, air was found to be an effective coolant but not as efficient as a water spray in controlling temperature rise during the cutting of tooth structure with rotary instruments.

A water spray has been found to be most practical for clinical application. A finely adjusted vapor spray provides sufficient volume of air to keep the mirror surface and the surrounding area clear enough for vision of the operating field and at the same time drives sufficient water against the instrument to flush away debris and prevent the cutting surfaces from clogging.

An appreciable increase is noticed in the rapidity with which a diamond instrument removes tooth tissue when a water vapor spray is played against its working surfaces. Furthermore, there is reason to believe that the life of these instruments is considerably increased when operated at high speeds and in the presence of water. While there are indications that the cutting efficiency of burs is increased by the lubricating and flushing action of a water spray, the improvement, observed in clinical application, is not as noticeable for burs as for diamond instruments. Both laboratory and clinical evidence makes it clearly apparent, however, that some type of coolant and flushing agent must be used in conjunction with all types of rotary instruments when they are employed at high speeds.

Adaptability of Present Equipment • In the past, the maximum speed for any make or model of dental unit has been about 6,500 rpm. Since this speed of rotation is not considered to be favorable for the use of diamond and carbide instruments, various methods have been employed to increase the rpm at the handpiece. The most common practice has been to vary the size of the motor and handpiece pulleys. Increasing the diameter of the pulley at the dental engine by a ratio of two to one over the diameter of the pulley at the handpiece increases handpiece speed by approximately the same ratio; however, excessive speed increases, beyond the normal rpm produced by a standard pulley arrangement, may reduce the power transmitted to the handpiece beyond practical limits. A more recent method of attaining a satisfactory range of speeds for the use of rotary instruments is to increase the rpm of the dental engine itself. By means of a relatively simple mechanical procedure, the resistors within the unit can be altered to produce engine speeds in the range of 8,000 to 16,000 rpm, according to the make and model of the particular unit. Higher speeds can be obtained by using

a combination of high speed pulleys on the motor and dental handpiece. The manufacturers give assurance that conversions can be made safely on all but the oldest models of dental units. All necessary changes can be made by the local dental maintenance technician.

Belt tension is an important factor to be considered in attaining maximum rpm, particularly in the upper ranges of speed. A variation in belt tension alone can change handpiece speed as much as 2,000 rpm, depending on the speed of the motor at the time. The pitch or sound of a rotating handpiece held near the ear is an excellent guide for determining the particular belt adjustment which produces the maximum instrument speed. Reducing belt tension when operating at high speeds minimizes frictional drag on handpiece bearing and engine arm pulleys.

The most neglected piece of equipment in the dental armamentarium is the dental handpiece. Figures indicate that the average cost per year for handpiece maintenance in the dental office is exceedingly high. A considerable proportion of these maintenance costs can be attributed to improper cleaning and lubrication. The introduction of high speeds into operative procedures makes the problem of handpiece care and maintenance even more acute. While present standard handpieces can be used successfully at relatively high speeds, it is necessary to establish a routine for frequent cleaning and relubrication of this equipment to prevent overheating and excessive wear. A handpiece in poor condition produces excessive vibrations at high speeds and therefore cannot be employed successfully in these technics.

A study is being conducted at the School of Dentistry, University of Southern California, to determine the comparative efficiencies of the various dental handpiece lubricants on the market. Preliminary investigations have indicated that these commercial products vary considerably in their lubricating qualities when subjected to tests at high speeds. It has also been noted in this study that certain lubricants containing chemicals intended for the purpose of sterilization appear to break down at higher speeds of rotation and under heavier work loads. It was a matter of considerable interest that tests made with lubricants containing a recommended percentage of one of the commercial friction-proofing additive elements now being used in the industrial field produced results superior to the regular dental lubricants that were used. Only the finest grade of light oils should be used to lubricate handpieces employed in high speed technics. The higher viscosity of heavier oils produces excessive heating. An excessive amount of lubricant also causes overheating. Dental manufacturers, as well as independent investigators, are giving a great deal of attention to the problem of motor and handpiece design. Improvements and refinements have already been made in the dental handpiece and other equipment which are increasing the practicability of employing high speeds in routine operative procedures.

Practical Application • It is suggested that a range of speeds should be selected by the individual operator which will produce a reasonable degree of efficiency and yet remain within practical limits of operating economy for the type and condition of the equipment he is using. The present standard handpieces and other equipment will continue to give satisfactory performance at speeds in the region of 12,000 to 13,000 rpm if kept properly cleaned, lubricated and in good repair. A range of speeds between 8,000 and 13,000 rpm has already been shown to produce a pronounced increase in the cutting efficiency of all types of rotary instruments. At relatively little cost the dental motor can be converted to produce speeds within this range.

Clinical studies have shown certain

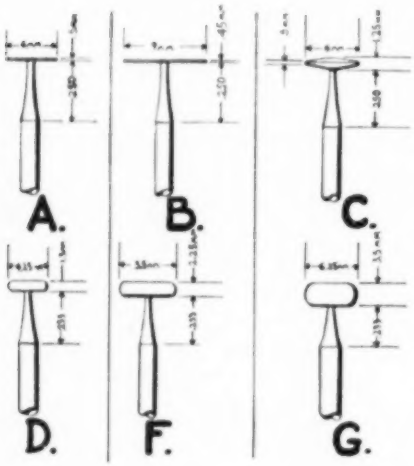

Fig. 1 • Dimensions of disk and wheel type diamond instruments for special technics. A: Medium-sized occlusal opening wheel for amalgam preparations, abrasive-bonded on both sides. B: Safe-sided proximal opening disk for onlay preparations, abrasive-bonded on shaft side only. C: Medium-sized V-type occlusal opening wheel for inlay preparations, abrasive-bonded on both sides. D, F and G: Three sizes of round-rimmed wheels for occlusal reduction in crown and onlay preparations

advantages in operating at speeds of 18,000 to 20,000 rpm; however, the most effective speed for rotary instruments has not been established by either clinical or laboratory studies. Until optimum operating conditions have been definitely established and equipment developed to withstand these speeds, it appears advisable that speeds in the more moderate range should be employed.

INSTRUMENT DESIGN

It is generally conceded that the most exacting and perhaps the most time-consuming phase of inlay, amalgam, and crown and bridge procedures is the preparation of the teeth to receive these restorations. One of the primary purposes of these studies has been to develop more effective instrument designs and improved methods for penetrating enamel and shaping cavities in tooth surfaces. The introduction of diamond instruments in recent years has provided a more efficient and a much faster method for the removal of tooth structure. The development of refined shapes and designs of these instruments is changing certain recognized concepts of preparing teeth for restorations.

Instruments of the disk and wheel type (Fig. 1) have been selected for the penetration of enamel and the removal of an initial bulk of tooth structure. By reason of their greater diameter, extremely high peripheral speeds can be attained. When used at high speeds of rotation, they remove tooth structure rapidly and with much less pressure than that required for attaining efficiency with the dental bur.[7] With the present refinements of the extremely thin safe-sided proximal opening disks and occlusal opening wheels, it is possible to penetrate enamel and to establish cavity outline form efficiently and rapidly. When these instruments are employed in a series of controlled cuts, proximal and occlusal extensions for inlay and amalgam cavities can be prepared to conform with the minimal extension requirements.

Cavity preparation first became a systematic science at the turn of the century with the publication of G. V. Black's fundamental orders of procedure. These simple and effective rules advocate that outline form be planned and established as the first step in cavity preparation. Complete adherence to Black's orders of procedure is not possible when a bur is employed for the initial penetration of enamel, for the internal portion of the cavity must be milled out first. The outline form is then established by means of a series of push and pull cuts, penetrating the enamel from the inner portion of the preparation outward. With diamond disks, however, the enamel can be penetrated from its outer surface in-

ward; and cavity outline form can be established before any preparation of the internal portion is begun. Outline form is the primary consideration in cavity design. Its establishment should precede the other steps in the preparation of a cavity.

The key instrument used in these technics (Fig. 2) is the safe-sided disk (Fig. 2, A), which is 9 mm. in diameter and only 0.45 mm. in thickness. Figures 3 and 4 show the special functions performed by each instrument, Figure 3 for an amalgam preparation and Figure 4 for the preparation of an onlay cavity. The extreme thinness of the safe-sided disk permits proximal opening cuts for Class II cavities to be made with minimal buccal and lingual extensions. The short shaft brings the disk closer to the rotational axis of the contra-angle, and thus vibration is reduced. The thinly tapered neck of the instrument eliminates interference with the axial angles of the tooth while the proximal cut is being made and allows full use of its working surface (Fig. 3, C). The outer edge of the safe surface of the disk must be polished off at a slight angulation to eliminate protruding diamond particles that might mar an adjacent tooth surface.

The 9 mm. safe-sided disk is used (1) for rapid penetration of proximal enamel (Fig. 3, C), (2) to establish the proper proximal outline form for Class II inlay and amalgam cavities (Fig. 4, C), (3) to establish the position of the gingival floor of the cavity (Fig. 4, E) and (4) to remove the bulk of tooth structure within the proximal extensions of the cavity (Fig. 3, H).

Figure 2, B shows a medium-sized thin flat opening wheel used for penetrating occlusal enamel and establishing occlusal outline form for amalgam cavities. Instruments of this type, made with diameters of various sizes, have diamonds on both sides and are approximately 0.5 to 0.6 mm. in thickness. Less resistance is encountered when a thin instrument is used for penetrating enamel. The smaller instruments are used for making the occlusal opening in teeth with short cuspal height, while those of greater diameter are employed for teeth with greater cuspal height. When held in a mesiodistal position, wheels of this type continue to penetrate the tooth surface until the shaft of the instrument comes into contact with a cusp of the tooth (Fig. 3, G). The radius of the instrument determines the depth of the occlusal cut. Selection of the proper size of instrument for the individual preparation is a safeguard against overcutting the occlusal depth of the cavity.

Figure 2, C shows a medium-sized V-type diamond wheel used for penetrating enamel and for shaping the occlusoaxial walls of inlay cavities (Fig. 4, F). These instruments also are made in varying diameters to fit the needs of any particular case. An assortment of three sizes, 5, 6, and 7 mm., is sufficient for practical use. The tapering sides of the instruments prevent the undercutting of walls of inlay preparations. The edges are slightly rounded to provide more area for the deposition of diamond particles. In addition, the instruments are thinner at the center than the regular knife-edge wheels. These features allow more rapid penetra-

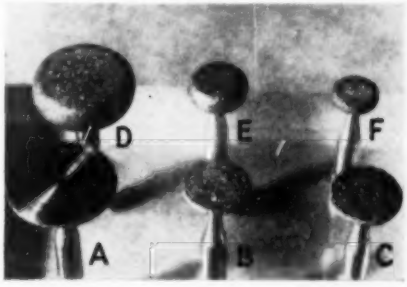

Fig. 2 • Instruments for cavity preparation. A, safe-sided proximal opening disk; B, occlusal opening wheel for amalgam; C, V-type occlusal opening wheel for inlays; D, E and F, three sizes of round-rimmed wheels for occlusal reduction in onlay and crown preparations

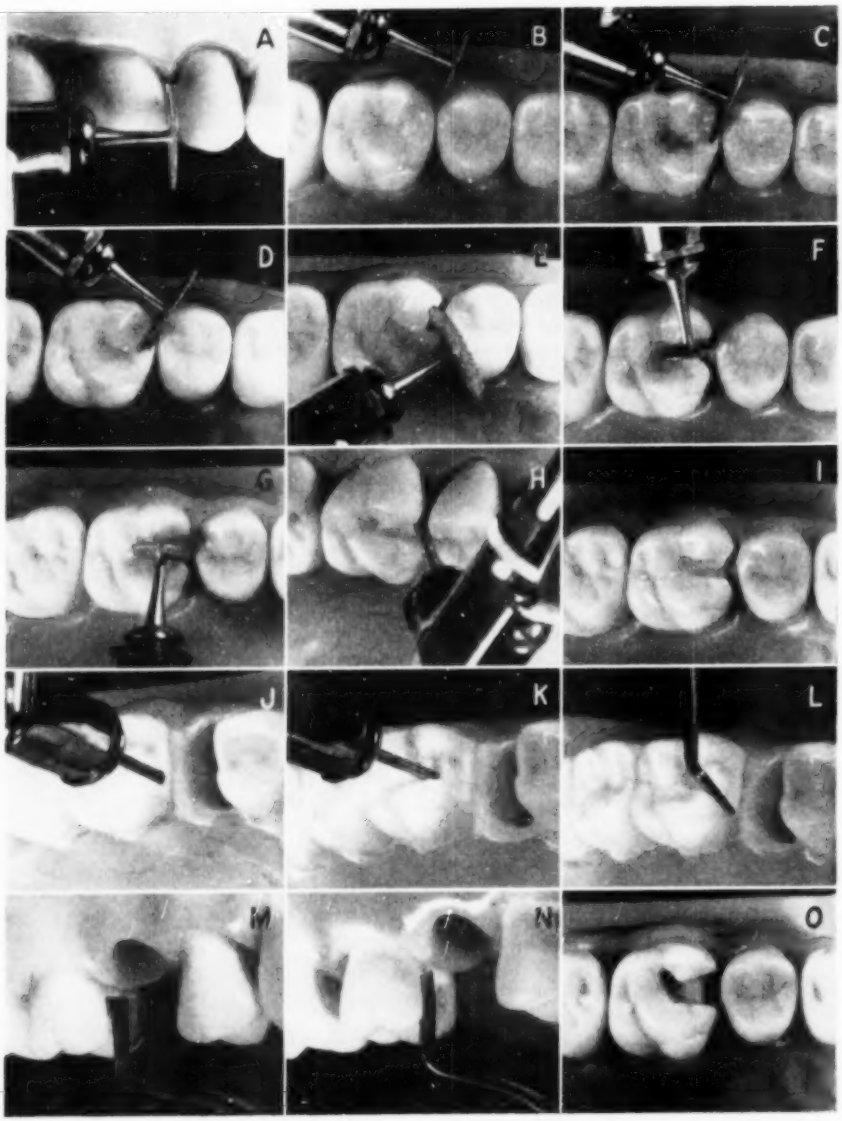

Fig. 3 • Special functions performed by each instrument in an amalgam preparation

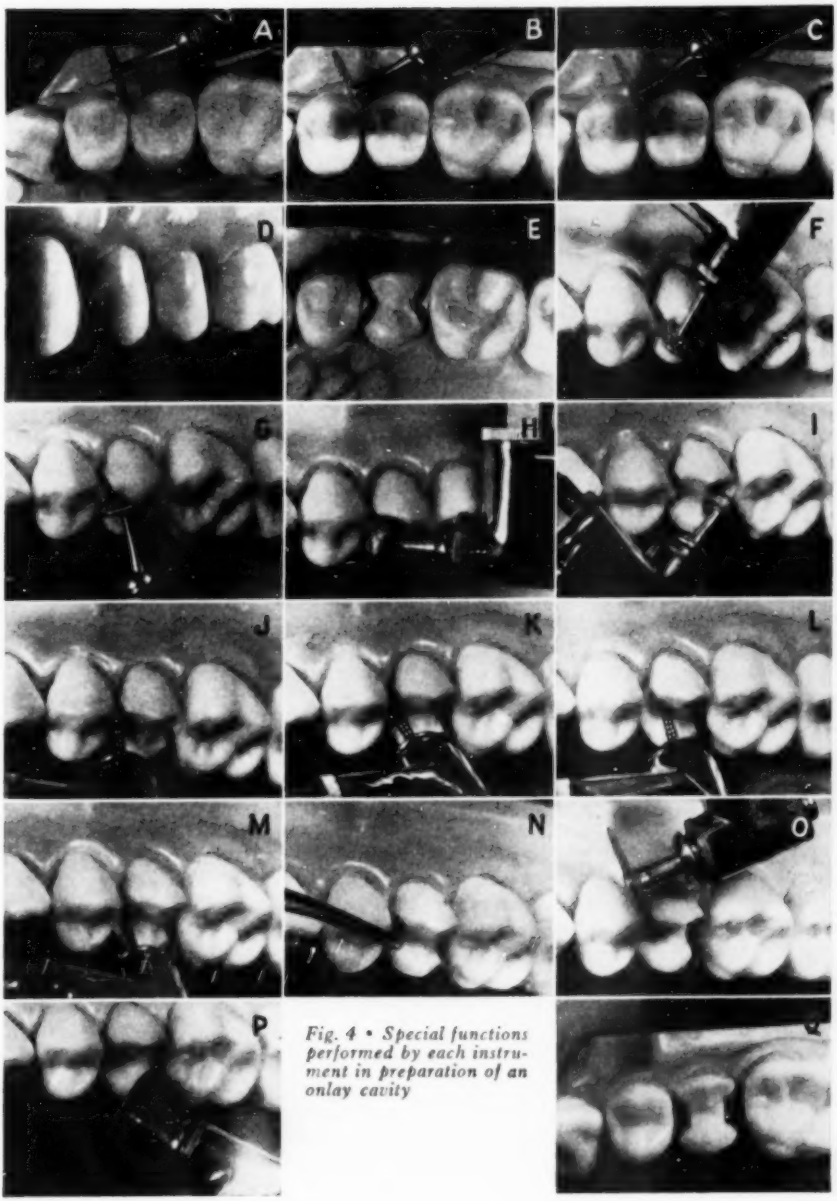

Fig. 4 • Special functions performed by each instrument in preparation of an onlay cavity

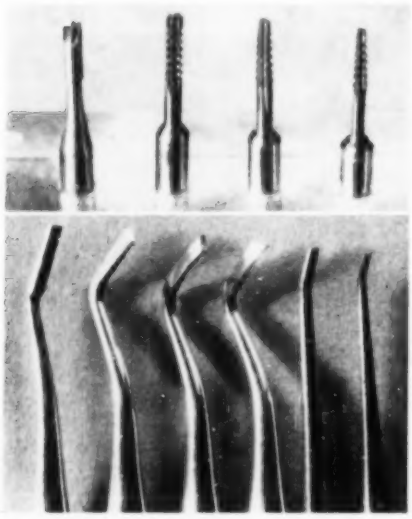

Fig. 5 • Modified end-and-side-cutting bur, tungsten carbide burs and Ferrier cutting instruments used in cavity preparation

tion of enamel and insure a longer life for the instrument.

Round-rimmed wheels are used to remove enamel for occlusal clearance in crown and onlay type preparations. With wheels of relatively small diameter, the buccal and lingual planes of the occlusal surface of the tooth can be slightly hollow-ground for clearance (Fig. 4, H). In this manner enamel may be removed uniformly in areas where occlusal clearance is necessary without undue sacrifice of tooth structure elsewhere. Figure 2, D and E, shows round-rimmed wheels of two sizes which are used in the preparation of onlay cavities in molar and bicuspid teeth. Figure 2, F, shows a round-rimmed wheel of much smaller diameter and less thickness, which is used for obtaining final clearance of the occlusal planes of the tooth and for the placement of contra-bevels on buccal or lingual cusps of onlay cavities.

Figure 5 shows a modified end-and-side-cutting bur, which is used to remove the wedge of proximal tooth structure that remains after the initial cuts have been made with the 9 mm. safe-sided disk. It is used also to establish the gingival wall of the cavity (Fig. 4, J). The modified bur of this type is easily controlled and provides a safeguard against injuring adjacent fillings or tooth surfaces. The side-cutting blades extend only 1 mm. from the end of the bur. If the instrument is held at a slight angulation toward the adjacent tooth with the smooth portion of the barrel resting against the adjacent marginal ridge, a fulcrum or guide is provided which insures adequate control while the cut is being made (Fig. 3, H). The diameter of the barrel prevents the bur from running out of the cavity and injuring a proximal margin. While an inverted cone bur may be used for accomplishing this step in cavity preparation, it is not as readily controlled. There are three sizes of this special bur: no. 901, no. 902 and no. 903. These burs correspond closely in size to the no. 556, no. 557 and no. 558 fissure burs.

Tapering fissure and straight fissure carbide burs are used to shape the internal cavity walls. Final instrumentation is accomplished with Ferrier hand instruments (Fig. 5 and 6).

The preparation of cavities within the limits of ideal extension is dependent to a large degree on the refinement and design of the instruments used. For this reason it is necessary to exercise care in the selection of instruments for these technics. The size of diamond particles used by different diamond instrument manufacturers varies considerably. While some operators prefer coarser grit diamonds, the finer meshes appear to produce a much smoother as well as a faster cutting action. No. 180 mesh is recommended.

TECHNICS

Since it is not possible to describe all the various operations accomplished with

these instruments, a few specific preparations have been selected to serve as an example of the ways in which these technics may be applied to cavity preparation in general.

Figure 3 illustrates in sequence the special functions performed by each instrument in the preparation of a Class II MO amalgam cavity:

A. The 9 mm. safe-sided disk is positioned in the long axis of the tooth and centered in the marginal ridge area. Centering the disk below the height of the marginal ridge would result in overextension of the gingival wall of the cavity.

B. The disk is introduced into the proximal embrasure at a slight angulation to produce as conservative a cut as possible and to safeguard against any possible injury to an adjacent tooth surface by its cutting edge.

C. After the instrument has been correctly positioned, maximum speed is obtained and the disk is allowed to penetrate into the marginal ridge area of the tooth.

D. It is then turned into the tooth to remove additional bulk. A constant pressure is maintained against the angle of the adjacent tooth with the safe side of the instrument to prevent any possible overextension of outline form.

E. The lingual disk cut is made in a similar sequence of steps. The execution of this cut varies in one respect. Instead of being held in the long axis of the tooth, the disk is positioned more nearly in harmony with the contour of the lingual cusp of the bicuspid. In this position the disk produces a uniform extension of the cavity wall into the lingual embrasure for convenience and at the same time allows for the conservation of tooth structure in the region of the marginal ridge. Once again, emphasis must be placed on the importance of maintaining a constant contact of the safe side of the disk against the adjacent tooth surface during these cuts.

F. The thin flat occlusal opening wheel is used to penetrate enamel in the region of the central groove.

G. The sides of the instrument are used to establish the approximate occlusal outline form of the cavity and to remove bulk.

H. The remaining wedge of proximal tooth structure is removed with the no. 902 modified end-and-side-cutting bur.

I. The smooth barrel of the bur is rested against the marginal ridge of the adjacent tooth while the cutting flutes remove bulk and establish the gingival wall of the cavity. As the bur penetrates toward the gingival extension of the cavity, the direction of insertion is changed to coincide more nearly with the long axis of the tooth.

J. A no. 557 or no. 558 tungsten car-

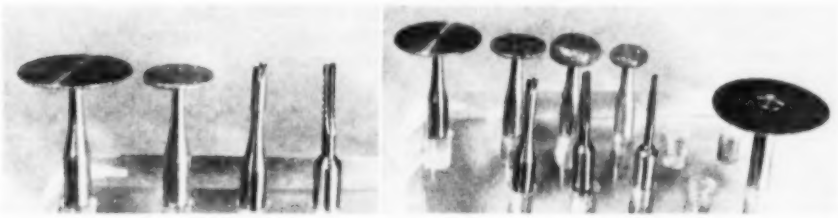

Fig. 6 • Left: Minimum set of special diamond instruments and burs for amalgam preparations. Right: Minimum set of special diamond instruments and burs for inlay and onlay cavities

bide fissure bur is used to define the surrounding occlusal walls and to establish the pulpal floor of the cavity.

K. It is employed also to smooth the internal walls of the proximal portion of the cavity.

L. The proper direction and finish of the buccal and lingual walls are established with a no. 15 double-ended binangle chisel. By changing the direction of this instrument, the retentive box forms of the proximal wall are established within the dentin.

M. A no. 15 distal marginal trimmer is used to accentuate the gingivoaxial line angle and define the proximal box forms of the cavity for retention.

N. A cavosurface finish is placed on the enamel margin of the gingival wall with the no. 15 margin trimmer. A slight bevel on this margin eliminates unsupported enamel rods.

O. Proper cavosurface finish is placed on the occlusal margins of the cavity with hand instruments or with a sharp bur run at high speed and used with light pressure.

Figure 4 illustrates in sequence the procedures for the preparation of an MOD onlay cavity:

A, B. The positioning of the 9 mm. disk and the initial entrance into the marginal ridge of the tooth are identical to the procedures used for an amalgam type preparation; however, an additional step in the procedure is necessary to establish the occlusal draft for an inlay or an onlay cavity.

C. While the edge of the disk near the gingiva is maintained at its minimum extension, the rim of the instrument nearest the occlusal surface is tipped in toward the tooth.

D. In this way, adequate draft is established for withdrawal of an impression.

E. The remaining three proximal walls are established in the same manner to complete the proximal outline form of the cavity.

F, G. A V-type occlusal opening wheel is used to penetrate enamel and to establish the occlusoaxial walls of the cavity.

H. Occlusal reduction is obtained further by removing a thickness of enamel from the buccal and lingual planes of the occlusal surface with a round-rimmed wheel of proper diameter.

I. The inclined planes of the occlusal surface may be hollow-ground for further occlusal clearance with the small 4 mm. round-rimmed wheel. This instrument is used also for placing the contra-bevel on the lingual cusp of the tooth.

J. The no. 902 modified end-and-side-cutting bur is employed to remove proximal bulk and to establish the gingival walls of the cavity.

K, L. A no. 701 tungsten carbide bur is used to accomplish the final shaping of the internal walls of the cavity.

M. The proximal box forms are defined with a no. 700 tapering fissure bur.

N. Gingival bevels are placed with the no. 15 margin trimmer. These bevels include about one-half the width of the gingival walls and are continuous with the proximal flares of the cavity.

O. Proximal and occlusal walls of the cavity are polished with one-half inch fine sand disks.

P. A disk, with the abrasive mounted away from the contra-angle, is used to place a polish on the lingual contra-bevel.

Q. This disk is used also to place a slight reverse bevel on the buccal cusp of the tooth. The reverse bevel must be continuous with the proximal flares.

Undergraduate students as well as practicing members of the profession for some time have been applying these technics successfully to general cavity preparation in the mouth. It is necessary, however, for those who are not acquainted with the procedures to spend a reasonable amount of time practicing on the typo-

dont or on extracted teeth mounted in proper alignment. It is suggested that the technics be applied only on selected cases at first and in regions of the mouth that are readily accessible. As more experience is gained, the procedures will gradually lend themselves to cavity preparation in nearly all regions of the upper and lower arches and on nearly all tooth surfaces. To attain skill in these technics, the operator must direct a great deal of attention to proper finger rest positions and supplemental support of the handpiece. Experience will dictate the proper direction of rotation for the most effective control of the instrument. Proper chair position and operating position are important for ease of operating. It is advisable to obtain direct vision of the field of operation whenever possible.

While considerable time may be required to attain the necessary experience in these technics, once they are mastered cavity preparation may become an easier and more enjoyable experience for the operator.

CONCLUSION

The introduction of high speeds, diamond instruments of special design and carbide burs into restorative procedures has provided a more efficient method for the rapid removal of hard tooth enamel. Through the application of carefully worked out technics and procedures, efficiency in cavity preparation may be increased while the time factor is reduced. A combination of high speeds, light pressures and the continuous use of coolants greatly reduces trauma incident to operative procedures. These are important factors in relieving nervous tension for both the patient and the operator. In the final analysis, success in the clinical application of modern instruments and increased operating speeds is dependent on the operator's knowledge of the many physiological and mechanical principles involved and on his mastery of special technics and procedures which, to some degree, change the present concepts of procedures in cavity preparation.

Peace and Democracy • The notable thing in Cervantes is that here also we do not sense any struggle . . . but instead supreme understanding between master and servant, between the high and the low in us. One cannot live without the other. This brotherhood, imposed at the same time by the internal necessity of the elements of our psyche which seek to complement themselves within the self, and also by the external need of the facts of life which force us to lean on our neighbor, has two names of great value. Internally it is called spiritual peace; externally it is called democracy. Two concepts that the men of yesterday and today have loved and still love, and which they have not known and still do not know how to convert into fruitful realities. *Joaquin Ortega, Rethinking Cervantes.*

Hydraulic turbine contra-angle handpiece

Robert J. Nelsen, D.D.S., Carl E. Pelander† and John W. Kumpula,‡ Washington, D. C.*

A high rotary speed enhances the efficiency of instruments used for cutting teeth in operative procedures. The small diameters of the dental cutting tools make it necessary to turn the instruments at high rates of speed in order to obtain effective linear speeds for the removal of enamel. For example, a ⅞ inch (22.2 mm.) disk rotating at 1,000 rpm has the same linear or surface speed as a 5/32 inch (3.9 mm.) disk dental tool rotating at 5,600 rpm. Some dentists have been reluctant to use high speeds in many operations in the mouth because of the hazard to the patient. This danger is due chiefly to the high inertia of the revolving instrument.

This report describes a contra-angle dental handpiece containing a small turbine which is propelled by a high speed stream of fluid in a closed system. This handpiece was developed at the National Bureau of Standards in cooperation with the American Dental Association. Because of certain characteristics inherent in hydraulic systems, many of the objections to the use of high rotary speeds in cavity preparation can be eliminated with the use of this new instrument.

THE UNIT

The unit is shown in Figure 1. It consists of a mobile cabinet which contains a fluid pumping mechanism, a reservoir, a pressure switch, a solenoid valve and distribution lines. The contra-angle handpiece (Fig. 1, A) is connected to a flexible coaxial double tubing (Fig. 1, B). The ⅜ inch inside tube carries the propellent fluid (water) under pressure to the contra-angle handpiece while the ⅝ inch outer tube carries the spent fluid back to the reservoir. The tubes join (Fig. 1, C) with the line directly from the pump (Fig. 1, D) and the line to the reservoir tank (Fig. 1, E). The flexible rubber hose (Fig. 1, F), which rests on the floor, is connected to a relay system by which the operator controls the fluid flow to the handpiece.

The unit is self-contained and needs only to be connected to an electrical outlet for operation. The fluid is stored in a reservoir tank and is used over and over; hence the unit requires no adjustment during its normal operating use. The pumping equipment is enclosed in a sound-insulated cabinet which minimizes undesirable noise during operation.

THE PUMPING MECHANISM

The pumping mechanism consists of a constant-volume pump (Fig. 2, A), close-coupled to a one-half horsepower electric motor (Fig. 2, B). The output of the

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‡Laboratory mechanic, National Bureau of Standards.

pump in this unit under no-load conditions is 1.6 gallons per minute. The fluid is taken into the pump from the reservoir tank above through the connection (Fig. 2, C). The fluid is discharged from the pump into a line (Fig. 2, D) which leads to the contra-angle handpiece. The fluid from the handpiece is returned to the reservoir through a line (Fig. 2, E). To stop the turbine, the operator steps on a tube (Fig. 2, F). This force closes the pressure switch (Fig. 2, G), completing a circuit and opening the solenoid valve (Fig. 2, H), which allows the fluid to bypass the turbine through a line (Fig. 2, I) and return to the reservoir.

While the instrument is being used, the motor and pump operate continuously; the handpiece is energized as needed by the operator controlling the flow of fluid through the instrument as just explained. The motor is controlled by a switch located on the side of the unit.

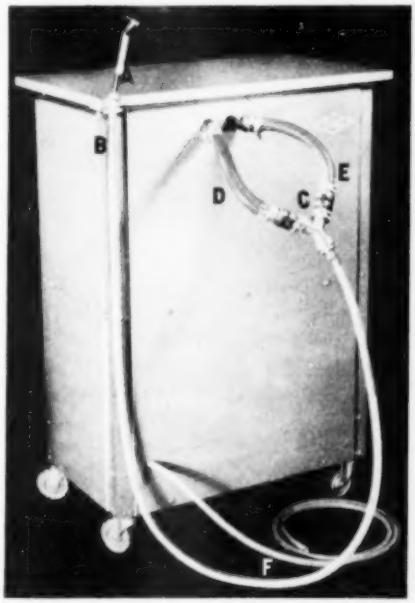

Fig. 1 • External view of assembly showing handpiece, A; coaxial double tubing, B; and junction, C, of line, D, from pump, and line, E, to reservoir tank

THE HANDPIECE

The use of air or water as motive power for dental rotary cutting instruments is not new. Iseman in a United States patent secured in 1940[1] and Norlen in a United States patent secured in 1952[2] both describe dental engines propelled by compressed air. In United States patents secured in 1878, 1877 and 1879 respectively, Straub,[3] Wilkerson[4] and Laurence[5] describe different means of driving a dental engine by the use of water as a propellent. Each of the engines was designed for the straight dental handpiece, and each required that a gear-type contra-angle handpiece be attached.

The handpiece is driven by a small turbine in the head of the contra-angle. The over-all size and shape of the new instrument are within the general proportions of the conventional gear-driven contra-angle handpiece. Figure 3 shows the comparative sizes of the hydraulic handpieces, A and B, and a conventional contra-angle handpiece, C, attached to a straight handpiece and wrist joint. The instrument shown in Figure 3, A is of an experimental design which permits various turbines and bearings to be inserted for testing. Figure 3, B shows the design of the instrument which would be more suitable for clinical use than that in Figure 3, A. The cutting tool in these instruments is attached directly to the shaft of the turbine.

1. Iseman, John. Dental tool. U. S. Patent No. 2,251,057, July 29, 1941.
2. Norlen, Per Ivar. Dental engine for compressed air. U. S. Patent No. 2,618,064, Nov. 18, 1952.
3. Straub, Ambrose W. Improvement in instruments for giving motion to tools. U. S. Patent No. 154,569, Sept. 1, 1874.
4. Wilkerson, Basil M. Improvement in dental engines. U. S. Patent No. 189,409, April 10, 1877.
5. Laurence, Henry. Improvement in dental engines. U. S. Patent No. 213,909, April 1, 1879.

The comparative size of the turbine and of the head of a gear-type contra-angle handpiece (S. S. White) is shown in Figure 4.

The turbine has six notched blades fixed to the shaft and measures 7.5 mm. in diameter and 4.8 mm. in height. In the design shown in Figure 5, stainless steel ball bearings are used. A thin metal disk to direct the flow of water away from the bearings is mounted on the shaft at each end of the turbine (Fig. 5, A). The radial load on the shaft is taken by the two stainless steel ball bearings (Fig. 5, B) placed at each end of the turbine. The upper bearing fits into a collar (Fig. 5, C) while the lower bearing is a press fit into the end plate (Fig. 5, D). The axial thrust is taken on a sapphire bearing (Fig. 5, E) mounted in the cap screw (Fig. 5, F).

Various combinations of plastic bearing materials have been used in place of the stainless steel ball bearings, which proved rather noisy and harsh in this application. Figure 6 shows an expanded view of a turbine assembly using plastic bearings, A, and journals, B. Nylon, Teflon, Rulon and stainless steel have been used in combinations. The three plastic materials have a low coefficient of friction and were not lubricated while in use. Bearings of these materials are much quieter in operation and give more satisfactory results than bearings of any other material used in this application to date.

The turbine shaft (Fig. 6, C) fits into the hollow shaft of the cutting instrument. A spring key attachment (Fig. 6, D) fits into a keyway in the instrument shaft and secures it to the turbine shaft. The centrifugal force developed by the rotating shaft causes this spring to lock the cutting instrument in place. When the shaft is still, however, it is relatively easy to attach and remove the cutting instruments.

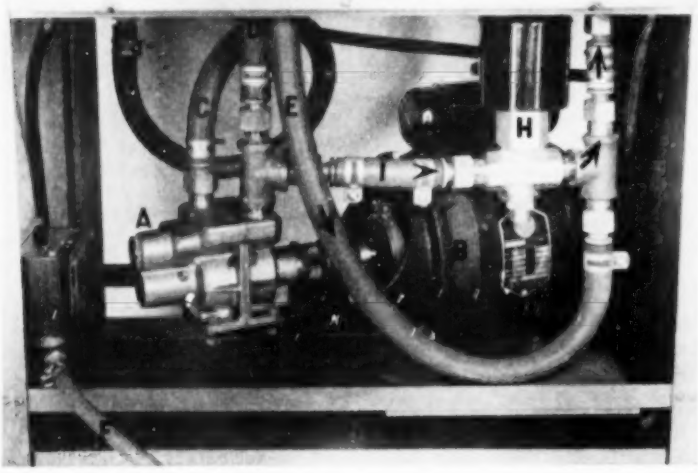

Fig. 2 • Pumping mechanism consisting of constant-volume pump, A, operated by one-half horsepower motor, B. Fluid enters pump from reservoir through line, C, and leaves pump through line, D, to handpiece. Line, E, returns the spent fluid to reservoir. Foot pressure on tube, F, closes switch, G, which opens solenoid valve, H, so that fluid is permitted to by-pass handpiece through line, I

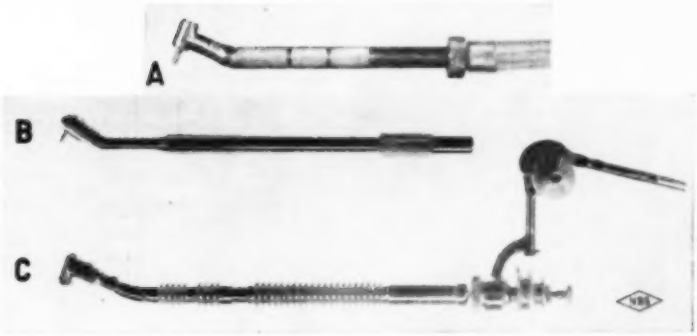

Fig. 3 • Comparative size of hydraulic handpieces, A and B, and conventional contra-angle handpiece attached to straight handpiece and wrist joint, C

OPERATIVE CHARACTERISTICS

Since the only rotating or moving element in this contra-angle handpiece is the turbine to which the cutting tool is directly attached, the vibrations due to the belt-and-gear driving mechanism of the conventional contra-angle are eliminated. The fluid passing over the turbine and shaft acts as a coolant. In spite of the high rotational speed developed, overheating of the instrument is prevented. Therefore, this instrument has a distinct advantage over the gear-type instruments which heat excessively at high speeds.

The rotational speed of the instrument depends on the amount of fluid which is forced past the turbine in a given amount of time. Also, the amount of torque developed by the turbine is proportional to the pressure of fluid passing through it. With the pumping mechanism previously described, 1.6 gallons per minute forced through the turbine produced a speed of 61,000 revolutions per minute. At this speed and with a 2 ounce radial load used against a Densco diamond instrument SC-6 (7 mm. in diameter and tapered from 1 mm. thick at the hub to a knife edge), an average of 4.2 mg. of tooth structure was removed per second from fresh extracted teeth. During this test it was found that a load of 3½ ounces on this diamond tool stopped it from rotating. This, in effect, means that if the operator were to press too heavily on the cutting tool or if the tool were to catch or bind in some manner that would ordinarily be hazardous, this instrument automatically would stop rotating. For instance, a belt-driven diamond-cutting instrument will entangle in a rubber dam or will cut through it if it makes contact with it while it is rotating. The same cutting instrument mounted in the hydraulic handpiece will not engage the rubber dam to any extent because there is insufficient torque developed to enmesh or tear the rubber. When disks of larger diameter are used, the effective torque is lessened. This is not a disadvantage, however, because with the increased diameter of the disk, there is an increase in the peripheral speed of the tool which compensates for the reduced torque. The actual cutting rate remains approximately the same. With the larger disks an extremely light pressure on the tool is used. Also, the disks will stop rotating when the cutting loads are light, and in this way the safety feature of the instrument is maintained. Any of the cutting instruments used, in-

cluding the 7/8 inch diamond disks, can be stopped while rotating at top speed (61,000 rpm) by placing a finger abruptly against the edge of the disk. The disk will stop immediately and will not injure the finger. As soon as the disk is released, the instrument will start rotating again. If excess pressure is exerted on the cutting tool and then released, no manipulation or adjustment of the instrument is required to start or stop the turbine.

The use of city tap water (about 40 pounds per square inch) to operate the turbine does not produce the same amount of torque and rotational speed that occur when the pumping unit is used. With tap water pressure one gallon of water per minute is forced through the instrument, and a rotational speed of 35,000 rpm and proportionally less torque are produced. The cutting ability of the instrument is considered not adequate when city water pressure is used.

It is extremely important that all the cutting tools used at these high speeds be accurately balanced. Any eccentricity or unbalance is apparent, as it causes vibration of the instrument and immediately produces an uneven wear on the cutting tool. The diamond instruments which have been used with this contra-angle handpiece show little sign of wear even though many old amalgam fillings have been removed with each of them. Silicon carbide mounted points and disks of medium grit used in this instrument were found to be highly efficient. The fine grit points, however, did not cut well. The silicon carbide points are less expensive than the average diamond instruments. Although they wear faster than the diamond tools, they retain their cutting ability as they wear, whereas the diamond instruments lose efficiency as soon as they begin to wear.

With this handpiece the preparation of teeth in the mouth can be performed with considerably less strain on the operator

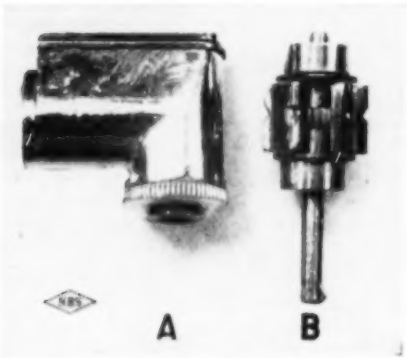

Fig. 4 • Head of conventional contra-angle handpiece, A, compared with turbine assembly, B

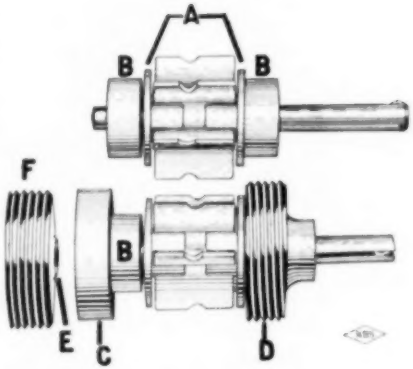

Fig. 5 • Turbine assembly using stainless steel ball bearings. Thin disks, A, direct water away from ball bearings, B, which are fitted into collar, C, and end plate, D. Sapphire axial thrust bearing, E, is mounted in cap screw, F

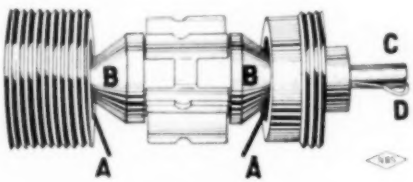

Fig. 6 • Turbine assembly using plastic bearings, A, and plastic journals, B. Turbine shaft, C, contains spring key attachment, D, which engages keyway on shaft of cutting tool

because of the extremely light pressures used. The cutting tools do not climb or roll out of the cavity as do those used in the slower-rotating instruments. The greatest advantage of the instrument is in the making of extracoronal preparations. For intracoronal preparations, the instrumentation advocated by Ingraham and Tanner is most suitable.[6] The extremely rapid cutting rate of this instrument makes it uniquely suited for occlusal equilibration procedures.

PATIENT REACTION

The patient's reaction to this type of instrumentation has been varied. None have remarked that this method of cutting teeth was more unpleasant than the usual method. The speed at which tooth structure can be removed and the short time that the instrument must be used are factors which enhance its acceptance by the patient. An insufficient number of patients have had cavities prepared with the instrument to draw a definite conclusion regarding the patient reaction to the actual cutting sensations.

LIMITATIONS OF THE INSTRUMENT

Because of the extremely rapid rate of cutting, this contra-angle handpiece does not lend itself to every type of rotary instrumentation. It is doubtful if the instrument can be used effectively with diamond or silicon carbide cutting tools smaller than a no. 560 steel bur (1.8 mm. in diameter). The various types of carbide burs did not cut tooth structure with any practical efficiency when used in this instrument. It is believed that the design of the cutting blades of all burs will have to be modified before they can be used at the rotational speeds of this instrument.

SUMMARY

1. The advantages of using increased rotary speeds in tooth-cutting procedures have long been recognized.

2. The operational hazards attendant on the use of high rotational speeds with conventional belt-and-gear-propelled cutting tools have been considerably reduced by the development of a hydraulic turbine contra-angle handpiece.

3. Rotational speed of 61,000 rpm with considerably higher cutting rate and lower cutting pressure than can be attained with conventional instrumentation is now possible.

4. The mechanical difficulties of excessive vibration and heating characteristic of the gear-type contra-angle handpiece have been eliminated by positioning the turbine in the head of the new instrument. Therefore, no gears are required.

5. Milling cutters such as steel and carbide burs of current design do not function well in this hydraulic headpiece. Grinding tools such as silicon carbide and diamond points and disks used with the handpiece cut with exceptional efficiency.

6. Even though some adjustment in the dentist's operative procedures is necessary, the instrumentation is basically the same as his present methods. Therefore, the use of this equipment will require no special training.

6. Ingraham, Rex, and Tanner, H. M. The adaptation of modern instruments and increased operating speeds to restorative procedures. J.A.D.A. 47:311 Sept. 1953.

COUNCIL ON LEGISLATION

American Dental Association statement on the Veterans Administration dental program

The material following is the text of a statement prepared by the Council on Legislation and presented to the Veterans Affairs Committee of the House of Representatives on July 14, 1953. This is the third time during this session that the Association has discussed the dental program of the Veterans Administration with Congressional committees. Congress is currently interested in examining and, perhaps, revising the system of dental benefits provided for veterans. The Councils on Legislation and Federal Dental Services have been studying this subject for the past two years, and the general subject will be considered by the House of Delegates at Cleveland. This statement will furnish a background of the questions involved for those who are interested and who may wish to express their views to the Reference Committee which will consider the subject during the annual session.

Mr. Chairman and members of the Committee:

I am Francis J. Garvey of Chicago, Illinois, the secretary of the Council on Legislation of the American Dental Association. I am here this morning, accompanied by Mr. Bernard J. Conway, secretary of the Association's Council on Federal Dental Services, to discuss the views of the Association with respect to the dental program of the Veterans Administration. I am sorry that Dr. Edward R. White of Jersey City cannot be with us this morning. While en route to Washington to present this testimony, he was taken ill and compelled to return home.

The American Dental Association, as the representative of 70,000 dentists, is sincerely interested in the dental program of the Veterans Administration. Various aspects of that program have been from time to time considered by the Association and its several councils; and presently, two councils are preparing recommendations with respect to changes for the consideration of the Association's House of Delegates in September. Thereafter the Association hopes to be able to make specific recommendations for new legislation to your committee.

THOUSANDS OF DENTISTS ARE VETERANS

Before taking up some of the specific matters in which you are interested, I think that you would like to know that the American Dental Association can appraise the dental program not only from the professional viewpoint of dentists but also from the sympathetic viewpoint of veterans. Many of our members over age 50 served in World War I, either as dentists or enlisted personnel; some 22,000 of our members were dental officers in World War II; and many of our newer members also served in that war, studying dentistry after discharge under the Servicemen's Readjustment Act sponsored by this committee. Presently some 6,000 of our members are on active duty in the armed services.

In the letter of your chairman requesting the Association to appear at this hearing, a number of questions were proposed. It is our intention to discuss only questions which relate to the dental program; however, since we believe that the real problem for consideration is the dental program itself and not merely the outpatient phase of it, we intend to discuss the nature and background of that program for the benefit of the Committee.

LEGISLATIVE HISTORY OF THE PROGRAM

Some form of dental benefits has been provided to veterans since 1919. In that year, Treasury Circular 165 directed the Public Health Service, then a unit of the Treasury Department and then charged with the medical care aspects of the veterans' program, to provide dental care for its beneficiaries including veterans. Such care was to be given on an outpatient basis, participating hometown dentists were to be used, and a fee schedule for operations was established. This directive was expanded in 1920 by Public Health Service Circular 77 which authorized both treatment for dental disabilities compensable in degree and adjunct dental treatment for hospitalized veterans. Dental treatment was mentioned in Public Law 47, 67th Congress, which established the Veterans Bureau. That law required that application for treatment be made within one year after separation from service or date of enactment, whichever was later. In 1922, Veterans Bureau Regulation No. 17 set forth detailed instructions for the handling of dental claims, established a rating schedule for such claims and applied the one-year presumptive rule to oral disorders.

The World War Veterans Act, 1924, (sec. 202, par. 9) again specifically authorized the Bureau to provide dental care and for the first time also authorized the furnishing of dental prosthetic appliances. Dental care was mentioned once more in Public Law 628, 68th Congress, approved March 4, 1925. However, dental benefits were repealed with all other benefits by Public Law 2, 73rd Congress.

They were restored by Veterans Regulation No. 7 for service-connected cases in March 1933. This was supplanted by Veterans Regulation No. 7 (a) in July 1933, which regulation remains the foundation of the dental program today. Under that regulation, "The Administrator . . . is authorized in his discretion to furnish to honorably discharged veterans of any war . . . and to men honorably discharged from the . . . Army, Navy, Marine Corps or Coast Guard for disabilities incurred in line of duty, such . . . dental services as may be found to be reasonably necessary for diseases or injuries incurred or aggravated in the line of duty in the active . . . service. Such persons may be furnished with such supplies, including dental appliances, . . . as the Administrator . . . may determine to be useful and reasonably necessary, which dental appliances . . . may be procured . . . either by purchase or manufacture. . . ."

The one-year presumptive period for dental diseases was reinstated under the authority of Public Law 141, 73rd Congress, approved March 28, 1934. World War II veterans were brought within the scope of hospital and domiciliary care benefits (which include adjunct dental service) by Public Law 10, 78th Congress, approved March 17, 1943. Public Law 16, 78th Congress, shortly thereafter made veterans' benefits, including dental care, available to prevent the interruption of a course of vocational rehabilitation training. In 1950, Congress, by Public Law 791, 81st Congress, established service-connection for all disabilities (including dental) of veterans of the Spanish-American War, the Philippine Insurrection and the Boxer Rebellion. Public Law 894, 81st Congress, granted to Korean veterans benefits similar to those conferred upon World War II veterans by Public Law 16, 78th Congress. Public Law 28, 82nd Congress, approved May 11, 1951, extended outpatient and inpatient benefits, including dental care, to Korean veterans.

1954 APPROPRIATION ACT RIDER

On that legislative history rests the Veterans Administration dental program. However, it is shortly to be modified again by a rider contained in the 1954 Independent Offices Appriation Act. That rider, if enacted into law in the form in which it passed the House of Representatives, will eliminate the one-year prima-facie period and will require all veterans, who do not have a dental disability at least equal to ten per cent of total physical disability, to establish, at time of discharge, existence of dental defects for which care is claimed and to make application for such care within one year after the date of enactment of the law or two years after date of discharge. This rider will amend by implication Public Law 791, 81st Congress, and will also require Spanish-American War veterans to prove service-connection for dental disabilities.

SUMMARY OF DENTAL BENEFITS

There is one other regulation which bears directly upon the scope of the problem, but I will defer discussion of that until later. At this time let me summarize the dental benefits to which a veteran is entitled:

He is entitled to inpatient dental care:

1. If he is hospitalized for treatment for a service-connected disability the cause of which is dental in nature.

2. If he is hospitalized for a service-connected disability not arising from a dental condition but dental care is necessary to cure his ailment. (This is known as adjunct care.)

3. If he is hospitalized for a nonservice-connected disability and dental care is necessary to complete his treatment. (This is known as ancillary care.)

4. If he is hospitalized for a long-term illness or if he is a member of a domiciliary institution, irrespective of whether the cause for hospitalization is service-connected. (This might be known as domiciliary care.)

He is entitled to outpatient dental care (which may be given either in a Veterans Administration installation or by a participating dentist):

1. If he has a service-connected dental disability amounting to ten per cent of total disability.

2. If he has a dental disability of less than ten per cent and he can establish that such disability occurred in service and was in existence at the time of his discharge, and if he applies for treatment within two years of the date of his discharge or one year after the enactment of the 1954 Independent Offices Appropriation Act.

3. If he is a veteran of the Spanish-American War and is in need of dental care. (This, however, may be affected by the 1954 Independent Offices Appropriation Act.)

4. If he is receiving outpatient care for some other service-connected disability and dental care is indicated as necessary to a cure, he may receive it as adjunct care.

5. If he is pursuing a course of training under either Public Law 16, 78th Congress, or Public Law 894, 81st Congress, and needs dental care to prevent interruption of training.

A veteran is never entitled to outpatient care on a nonservice-connected basis.

RECOMMENDATION OF THE ASSOCIATION

The American Dental Association believes that it is proper and necessary to provide what we have termed "domiciliary care" to veterans hospitalized for long-term illnesses or who are members of domiciliary institutions since such persons are, in effect, wards of the government. It believes also that the so-called adjunct or ancillary care should be made available to veterans, when, in the judgment of the physician and dentist concerned with the case, such dental care is necessary to aid in the improvement of the health of the patient. It would likewise approve the granting of adjunct (but not ancillary) care on an outpatient basis.

However, the Association cannot approve the basis upon which the present program is administered. This has nothing to do with the personnel involved in the program, but our disapproval is directed against the philosophy and scientific basis under which the program is carried on.

PHILOSOPHY OF VETERANS' BENEFITS

It is the belief of the Association that veterans' benefits fall logically into two classes: (1) those which are given in fulfillment of an obligation of the people of the country to those members of the population who served in the Armed Forces and as a result of that service suffered some injury or other disaster for which the country ought to compensate the serviceman, (2) those which are given as free gifts of a grateful people to those of its citizens who served in uniform.

Most service-connected benefits fall into the first group. Most nonservice-connected benefits fall into the second group. Now with respect to the second group, since benefits under this class are in the nature of a continuing gift, the flow of bounty can be withdrawn at any time. With respect to the first group, since they are in the nature of an obligation, they must be continued. However, it is perfectly proper for the obligor (here the government) to examine at any time the nature and extent of its obligation. If it is doing less than it ought, then more should be done. If it is doing more than it is obliged to do, then the excess over the obligation falls into the second group and may be either continued or withdrawn at the option of the giver.

Within these terms, what is the obligation of the government to the veteran for dental health care? We would say that it has an obligation to the individual while he is in service to refrain from doing anything which would decrease the state of his health below that which existed at the time of his entrance into service, and, if the exigencies of service are such that his health is deteriorated, then to restore it, insofar as it is possible, to a state of health comparable to that enjoyed by him at the time of induction. This obligation the government has assumed, and it attempts to discharge it through the agency of the Veterans Administration.

OPERATING REGULATION OF VETERANS ADMINISTRATION

The obligation for dental care is discharged under the authority of the laws which I have earlier mentioned. However, the day-to-day operation is predicated upon the following regulation (Regulation 170, Section 9162), originally adopted in 1927 and still in effect: "Each individual missing or defective tooth and each disease of the investing tissues will be considered separately and service-connection

granted only for the specific disability shown by the evidence to have been incurred in, or aggravated by service. Teeth extracted subsequent to discharge, due to service-connected disability, will be considered as extracted or lost in service. Impacted teeth will not be considered as incident to or aggravated by service."

This regulation directs adjudicating personnel what to consider and how to assign service-connection. After adjudication it is the practice to allow the professional judgment of the dentist to be the determining factor as to the extent of treatment to be given for each disability noted. However, it is the practice of the Veterans Administration to consider that once service-connection is granted for a tooth or for a tooth space that the particular tooth or tooth space must be cared for throughout the life of the veteran.

In other words each tooth or tooth space is considered as an entity in itself for purposes of service-connection, and treatment is granted accordingly.

The practice based upon this theory is one of the contributing causes to the present and prospective high cost of the program. Dentists and the American Dental Association consider that the theory is scientifically unsound and that the practice goes beyond the obligation of the government to the veteran. To understand this, let me first review the method by which adjudication is made and then discuss the nature and prevalence of oral disease.

ADJUDICATION PROCEDURE

Adjudication is made on the basis of the serviceman's health records or, where they are missing or incomplete, upon the basis of other evidence in support of the claim. The first thing to be considered is the state of the mouth at the time of the induction or entry into service. This is compared with the chart of the mouth as of the time of discharge. If a tooth was indicated as having no fillings or cavities at the time of induction but that there are fillings or cavities at the time of discharge, that tooth is granted service-connection. If a tooth was filled at the time of induction and the record shows subsequent fillings or treatment, that tooth will also be deemed to be service-connected. If a cavity was present at the time of entrance and is still present but untreated at the time of discharge, no service-connection is granted. If a tooth is removed in service which was sound at time of entrance, the tooth space will be given service-connection. Once service-connection is granted, all services necessary to support the tooth or tooth space will be given by the Veterans Administration which professional judgment indicates to be necessary. Thus a tooth will be refilled if new cavities develop, an artificial tooth will be inserted if the tooth is lost, and bridges covering missing nonservice-connected teeth will be made where such procedure is necessary in order to supply an artificial tooth for the service-connected tooth space.

CONTINUING BENEFITS PREDICATED UPON UNSOUND SCIENTIFIC THEORY

The Association considers this philosophy to be unsound scientifically because, so far as anyone can tell, there is nothing peculiar about service conditions which will cause an individual to have had more or fewer cavities than he would have had had he not been in service. At the present level of dental knowledge, a properly placed filling or other restoration is all that can be done for a carious tooth. If, subsequently, another cavity appears in the same tooth, in most cases, it will arise from a separate cause and cannot be considered as a sequela or result of the first cavity. Consequently, the Association would consider that if a tooth was filled in service and the filling was in place at the time of separation, such tooth should not be considered as service-connected since all that could possibly be done with respect to the cavity which occurred in service had already been done. Similarly, if the record shows that cavities are present at the time of separation and the tooth is in such condition that a filling or other restoration can be made, then the obligation of the government should be fulfilled by the accomplishment of that restoration. Again, if extraction is indicated, the obligation of the government should be to supply a satisfactory prosthetic appliance. To support the tooth for life, over and above these procedures, falls within the class of gift benefits referred to earlier. The Association firmly believes that the obligation to care for one's health is primarily the obligation of the individual. Consequently, after the government has fulfilled its obligation on account of disabilities arising in service, we believe that such individual should take over for himself. We believe that a satisfactory filling or a completed appliance properly installed should fulfill that obligation.

CLASSIFICATION OF DENTAL DISEASES

For purposes of this discussion oral disorders may be classified roughly into three groups:

1. Traumatic injuries, that is, those caused by an outside force such as might result from

a gunshot wound in the jaw or from receiving a rifle butt in the face. These are clearly service-connected, and the necessity for continuing care can easily be determined from the nature of the injury itself and from the progress of the patient.

2. Periodontal disease, that is, disorders of the gums. Since with the exception of specific infections such as Vincent's angina, commonly called trench mouth, these are rare in the age groups generally in service, service-connection for them is relatively rare; and where it is granted, the professional judgment of the dentist can readily determine when the particular disorder is cured so that the government can be discharged from further obligation.

3. Caries, that is, cavities in the teeth. This is one of the most prevalent diseases of mankind since it affects about 95 per cent of the population. Studies have indicated that tooth decay is a problem that begins at birth and continues throughout life—or so long as a person has his natural teeth. We can expect that 50 per cent of all children at the age of 2 will have one or more carious teeth and that by the age of 6 at least 3 primary teeth will be affected. Fourteen per cent of all children will develop cavities in their first permanent molars, and by 16 most children will have at least 7 teeth which are decayed, missing or filled, with 14 tooth surfaces affected. At 50, nearly half of the population will be wearing some form of denture or will have missing teeth which ought to be replaced artificially. From this you can see that the occurrence of caries during the period of service is something which probably would have happened to the individual even had he never donned a uniform.

Since caries is the most prevalent of all dental diseases, it follows that treatment of this disorder will naturally be one of the great problems of the Veterans Administration. If the theory that each tooth is a service-connected entity is adhered to, the development of new cavities in teeth will involve expensive repeat treatment and, if the tooth is ultimately lost, will involve its support through prosthetic appliances. Further, it leads to the care of nonservice-connected teeth, since if three teeth in a row are missing and one is service-connected, the only way that an appliance for the service-connected tooth can be made is to make one for the entire space.

DENTAL PROBLEMS ARE ACCUMULATIVE

Since dental disorders are accumulative and since the affected individual neither dies nor gets well, it can readily be seen that accumulated neglect or even some months of delay in treating an early manifestation of disease can lead to more complicated and expensive treatment than would have been required had early treatment been given. But because Congress either will not appropriate enough money to meet an accumulated backlog or because it is not made available administratively for this program, a natural consequence is that treatment cannot be given as needed, and additional expense results.

If you weigh these facts which I have presented against the total number of veterans theoretically eligible for dental treatment and consider the additional liability assumed under the "tooth-entity" theory, you will see that the costs of the program will always be extremely great.

SUGGESTIONS TO CONGRESS

What can the Congress do about the program which will be fair to both the veteran and the taxpayer? Although the Association will not be prepared to make a specific recommendation before our House of Delegates passes upon the question, as we see it now there are several alternatives open to the Congress.

One of these would be to examine the laws granting dental care in the light of the administration of those laws and determine if perhaps more liberality is being shown than is required under the specific wording of the law. Congress has always been extremely liberal with veterans, but it is possible that it never intended to grant as much as is now available in the way of dental benefits. If the Association's views are accepted that no more can be done for a carious tooth than to make a restoration or for a missing tooth than to provide a replacement, then the "tooth-entity" theory would be destroyed and much of the repeat treatment now given would no longer be allowed.

Another alternative might be to amend the existing laws so as to put a time limit upon the eligibility of a veteran for dental care after his discharge or the enactment of the law. There is precedent for this procedure in Public Law 47, 67th Congress. The proposal has also been made in two bills now pending before your committee, and something similar was briefly considered but rejected during the debate on the Independent Offices Appropriation Act, 1954, rider relating to dental care. This question would have to be studied carefully from many viewpoints before categorical limits could be set.

A third way might be to discard present laws relating to dental treatment with the

exception of those applying to domiciliary, adjunct and ancillary care and to substitute a "one complete treatment" mechanism. Such a system might work as follows: At the time of discharge all dental defects would be noted by the examining dentist at the separation center. If not corrected there, the veteran could be given a certificate, with a copy to the Veterans Administration, indicating exactly the work to be done. The veteran could then present his certificate to the Veterans Administration for endorsement of its approval, and then take the endorsed certificate, within a time to be fixed after separation, to either a Veterans Administration clinic or to a participating dentist and have the work described in the certificate performed. If a participating dentist did the work, he could certify its completion on the certificate and return it to the Veterans Administration for payment. Such a procedure would eliminate the need for adjudication and other administrative procedures and also the need for repeated examinations to determine what work had to be done. The time limit would act as a cost-limiting factor unless the Congress would from time to time extend the period.

This procedure would answer the problem for the future veteran, but it would not solve matters so far as present veterans are concerned. But it might be possible to adopt a similar procedure by offering corrective treatment to all veterans for any defects presently in the mouth as a complete fulfillment of the government's obligation to the veteran. If those who desired to avail themselves of such benefits were required to apply for examination and treatment within a series of time limits to be fixed according to age groups, with a requirement for completing treatment within a reasonable time after the examination, it might be possible within a few years to dispose of the existing backlog of obligation. These procedures would be initially expensive, and much money would have to be appropriated in each of the next few years to get the job done; but thereafter, if Congress held firm, the dental problem would be both manageable and within reason as to cost.

Your committee had asked specifically about the outpatient program. We hope that our testimony has indicated to you that it is not the outpatient phase of the program which is the problem but rather the program itself. Whether dental care is given in Veterans Administration clinics or by participating dentists is merely a detail to be determined administratively as a method for accomplishing a job which the Congress has assigned to the Veterans Administration. It is manifestly impossible to procure enough dentists as employees of the Veterans Administration to solve the problem in that way. It is hardly possible to meet today's demands under the program even with the help of participating dentists.

The real question which faces this committee is: "What sort of dental benefits will be provided to veterans?" In this statement we have merely tried to indicate the scope and extent of the problem. We would recommend that this or some other subcommittee set aside a special hearing time of one or more complete days to consider only dental problems. They are sufficiently complex and sufficiently numerous to warrant such attention, and we believe that such hearings would prove fruitful. We thank you for the time you have given us and will be happy to try to answer any questions you may have.

COUNCIL ON DENTAL RESEARCH

List of certified dental materials

Since the publication of the most recently revised List of Certified Dental Materials (revised to September 1, 1952) in the November 1952 issue of THE JOURNAL, the following material has been added.

CERTIFIED INLAY CASTING INVESTMENTS
(A.D.A. SPECIFICATION NO. 2)

Investment	*Manufacturer or distributor*
Baker Cristobalite	Baker & Co., Inc.

COUNCIL ON DENTAL HEALTH

Annual survey shows more than 14 million persons in United States routinely drinking fluoridated water

For the last three years, the Council on Dental Health has conducted an annual survey on the status of fluoridation in the United States, its territories and possessions. The 1953 survey reflected the progress of the caries-preventive measure through the first five months of this year.

At the end of the survey period (Table 1), more than 14 million persons in 43 states and the District of Columbia were found to be routinely drinking fluoridated water. With the 3,570,021 individuals previously determined by the U. S. Public Health Service as drinking water with a natural content of 0.7 to 2.0 ppm of fluorine, the total number of persons receiving the optimum amount was 17,794,683, or better than 11 per cent of the U. S. population. According to Public Health Service statistics, 66 per cent of this country's 160,000,000 people live in areas served by 16,750 public water supplies, so better than 17 per cent of those to whom the caries-preventive measure is available were receiving its benefits.

Questionnaires were mailed to the health departments of the 48 states, the District of Columbia and the territories and possessions of the United States. The dental directors or health officers were requested to report the names and populations of communities receiving fluoridated water, the respective dates the projects started operation and any instances of unfavorable community actions in opposition to fluoridation. Replies were received from 45 states, the District of Columbia and Alaska. For the three states that did not return questionnaires—Missouri, Nebraska and Vermont—reports received previously were used in tabulating the survey in order to provide a nationwide report on the status of fluoridation.

Since 1945, when the first six projects serving 209,547 persons were established in the United States, acceptance of the public health procedure has continued to increase—with notable crescendo since 1950 (Table 1) when the House of Delegates of the American Dental Association recommended the fluoridation of communal water supplies. Additions in succeeding years were as follows: 1946, seven (92,613); 1947, four (96,276); 1948, seven (105,260); 1949, twenty (442,129). Adoption of the procedure had its greatest impetus during the year 1952 (Table 1) when more than half the population now drinking fluoridated water first began receiving the benefits of the caries-preventive measure.

No new states have been added to the fluoridation roster since 1952, nor have projects been reported in any of the U. S. territories or possessions. The states in which projects have not yet been adopted are Arizona, Missouri, Nevada, New Mexico and Utah.

In 87 communities in 22 states, the benefits of fluoridation have been temporarily denied to more than four million individuals through unfavorable actions, such as injunctions sought by religious and political opponents of fluoridation, failure to act or disapproval by city councils, or rejection in referendums. Such

Table 1 • Fluoridation programs adopted from 1950 to 1953 (first five months)—communities and population by states

State	1950		1951		1952		1953		Total	
	Number of communities		Number of communities		Number of communities		Number of communities		Total no. of communities	Total population
Alabama •			3	52,734	1	12,000			4	64,734
Arizona									0	
Arkansas			5	164,989	2	8,941	2	8,056	9	181,986
California			1	1,819	4	1,274,995	1	3,330	6	1,280,144
Colorado			1	14,435	3	3,848	3	10,022	7	28,305
Connecticut	3	82,613	1	2,500			1	8,500	6	95,413
Delaware	1	6,731							1	6,731
Dist. of Columbia*					2	890,000			2	890,000
Florida			2	3,943	8	354,117			11	384,637
Georgia			14	163,033	8	74,939			22	237,972
Idaho					9	31,055			10	44,040
Illinois			1	5,389	11	79,745	3	13,290	17	179,481
Indiana			9	578,337	12	153,579	10	151,051	31	882,967
Iowa			2	52,829	8	175,038	4	19,216	14	247,083
Kansas			1	2,900	10	65,908	2	22,897	14	101,705
Kentucky			24	435,920	10	70,921			34	506,841
Louisiana					1	4,604			1	4,604
Maine					1	3,100			1	3,100
Maryland			60	343,119	104	1,202,538			164	1,545,657
Massachusetts			4	29,089	4	111,302	6	41,238	16	185,399
Michigan			18	502,098	8	141,477	2	14,243	37	859,040
Minnesota			9	43,059	19	372,691	4	12,486	32	428,236
Mississippi			2	20,045					2	20,045
Missouri†									0	
Montana					2	5,159	1	200	3	5,359
Nebraska†			2	15,018	2	13,267			4	28,285
Nevada									0	
New Hampshire					1	27,988			1	27,988
New Jersey	4	25,000					21	139,063	25	164,063
New Mexico									0	
New York			9	119,195	6	406,082	7	223,578	23	780,855
North Carolina	1	15,500	1	86,816	12	251,573	1	9,000	18	498,724
North Dakota			1	1,168	3	52,721	2	9,878	6	63,767
Ohio			3	11,747	6	318,558	1	57,591	10	387,896
Oklahoma			1	3,904	2	30,762	1	17,831	4	52,497
Oregon			1	568	7	49,656			8	50,224
Pennsylvania			4	17,500	12	669,000	21	216,500	37	903,000
Rhode Island					9	401,881			9	401,881
South Carolina	1	3,000	2	8,500	2	39,824			5	51,324
South Dakota			1	21,011	2	7,602			3	28,613
Tennessee			2	8,950	12	209,671	4	184,263	18	402,884
Texas			6	101,837	3	74,087			11	306,227
Utah									0	
Vermont†					2	42,000			2	42,000
Virginia			4	81,427	18	771,562	2	20,841	24	873,830
Washington‡	1	11,380			2	5,767			3	17,147
West Virginia			2	25,818	1	3,837	3	94,532	7	183,078
Wisconsin	29	288,280	28	131,632	16	68,543	6	9,475	99	749,315
Wyoming			1	11,400	2	16,185			3	27,585
Total	40	432,504	225	3,062,729	347	8,496,523	108	1,322,727	764	14,224,662

*Project serves 1,075,000 persons in Washington, D. C., and surrounding area; the balance of the population is shown under Virginia.

†No reply received; tabulation based on previous reports.

‡Includes Kennewick where fluoridation has been stopped temporarily because of mechanical difficulties; no official unfavorable action has been taken.

Table 2 • Fluoridation programs reported in U.S. June 1—July 31, 1953

State	No. of communities	Population
Idaho	1	2,682
Indiana	1	35,646
Iowa	2	13,799
Mississippi	1	41,709
South Carolina	2	11,995
Wisconsin	7	732,800
Total	14	838,631

unfavorable actions, however, have resulted in the discontinuance of project operation in only six communities. They were Mount Dora, Fla. (3,028); Assumption, Ill. (1,466); Williamstown, Mass. (6,194); Elroy (1,654), La Crosse (47,535) and Stevens Point (16,564), Wis.

Information included on various questionnaires indicated that over four million additional persons would be receiving the benefits of fluoridation when programs now under consideration are put into operation. Supplementary reports since the end of the survey (Table 2) showed that by July 31, 1953, 14 additional communities with a combined population approaching one million had started programs. The new projects included one at Milwaukee which serves six suburbs in addition to the Wisconsin metropolis.

A mimeographed list of the cities receiving fluoridated water in the United States is available from the Council on Dental Health.

COUNCIL ON DENTAL EDUCATION

Accreditation of dental hygiene programs

The Council on Dental Education has completed the first nation-wide evaluation of the programs for the training of dental hygienists. The following list of schools represents those whose programs, in the judgment of the Council, are worthy of accreditation, and the Council recommends that the state boards of dental examiners accept as eligible for examination the graduates of these schools. A few schools have not been included because evaluation has not yet been possible. In some instances the schools were not ready for a visit and an evaluation; in other cases, the schools did not have their two year program in full operation; in other cases, more information is needed before evaluation can be completed.

As in the case of the dental school appraisal, the accredited dental hygiene programs are classified as "approved" or "provisionally approved." The approved programs meet the requirements and standards of the Council. The "provisionally approved" programs have been judged worthy of accreditation also; but there are certain weaknesses which prevent their inclusion in the "approved" category; in each case, however, there was evidence that the needed improvements were in process of being made or that the present weak areas were being strengthened. Supplemental reports on

the accreditation of dental hygiene programs will be issued from time to time, and an article on dental hygiene education will appear in an early issue of THE JOURNAL.

ACCREDITED DENTAL HYGIENE PROGRAMS

All of the dental hygiene programs which have been approved or provisionally approved are recognized by the Council on Dental Education as accredited. The programs in the following list designated with an asterisk (*) are provisionally approved; the others are approved.

California

Division of Dental Hygiene, College of Dentistry, University of California, San Francisco.

Connecticut

Fones School of Dental Hygiene, University of Bridgeport, Bridgeport.

District of Columbia

Department of Oral Hygiene, College of Dentistry, Howard University, Washington.

Illinois

Courses for Dental Hygienists, The Dental School, Northwestern University, Chicago.

Indiana

Curriculum for Dental Hygienists, School of Dentistry, Indiana University, Indianapolis.

Massachusetts

Forsyth School for Dental Hygienists, Forsyth Dental Infirmary, Boston.

Michigan

Department of Oral Hygiene, School of Dentistry, University of Detroit, Detroit.

Curriculum in Dental Hygiene, School of Dentistry, University of Michigan, Ann Arbor.

Minnesota

Course for Dental Hygienists, School of Dentistry, University of Minnesota, Minneapolis.

New York

Courses for Dental Hygienists, School of Dental and Oral Surgery, Columbia University, New York City.

Department of Dental Hygiene, Institute of Applied Arts and Sciences, State University of New York, Brooklyn.

Ohio

Division of Dental Hygiene, College of Dentistry, Ohio State University, Columbus.

Oregon

Department of Dental Hygiene, The Dental School, University of Oregon, Portland.

Pennsylvania

School of Oral Hygiene, Temple University, Philadelphia.

School of Oral Hygiene, University of Pennsylvania, Philadelphia.

Tennessee

*Division of Dental Hygiene, School of Dentistry, Meharry Medical College, Nashville.

*Course in Dental Hygiene, College of Dentistry, University of Tennessee, Memphis.

Vermont

School of Dental Hygiene, University of Vermont, Burlington.

Washington

Department of Dental Hygiene, School of Dentistry of Washington, Seattle.

West Virginia

*Department of Dental Hygiene, West Liberty State College, West Liberty.

Wisconsin

Department of Dental Hygiene, The Dental School, Marquette University, Milwaukee.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

Survey of needs for dental care
V. Dental needs according to income and occupation

The factors correlated with dental needs in this and in previous chapters are by no means independent from each other.[1] Thus, the relationship shown between income and dental needs is not entirely distinct from the relationship between dental needs and length of time since last visit to a dentist, because a close relationship obviously exists between length of time and income. There is of course a connection between income and region of the country. Similarly, correlations of varying degree exist between other factors which have been related to dental needs in this survey.

As shown in Tables 21 and 22, the number of teeth needing fillings varies somewhat according to income. However, the variation is not pronounced until the highest income bracket is reached, when there is a relatively sharp drop in number of teeth needing fillings.

Older patients with very low incomes had relatively few teeth needing fillings. The reason for this becomes apparent on inspection of the figures on total extractions needed and permanent teeth already missing. The patients 50 and over in the lowest income group averaged about twice as many teeth either missing or requiring extraction as patients of the same age in the highest income group. The males in the highest age and lowest income bracket averaged 24.16 teeth either missing or indicated for extraction; females the same age and income levels averaged 17.57 teeth either missing or to be extracted. It appears that the relatively small amount of decay found among these patients results from the absence of many susceptible teeth.

The number of extractions required because of decay shows a marked variation according to the income of the patient. For both males and females this need was about five times as large in the lowest income bracket as in the top income bracket.

In the lower income groups, males had a greater number of teeth needing fillings than females, but the situation was reversed in the upper income groups. There was much more variation in the number of teeth needing fillings according to income among males than among females. The same comparison holds true when number of teeth requiring extraction because of decay is added to the number of teeth needing fillings. It appears that economic status is not as great an obstacle to timely dental care among women as it is among men.

Tables 21 and 22 show a pronounced correlation between income and need for complete dentures. For instance, for male patients age 50 and over, 62.2 per cent of the lowest income bracket needed one or more complete dentures, compared with only 15.7 per cent in the highest income bracket. The analogous figures for women were 43.2 per cent and 11.9 per cent.

1. The preceding articles in this series were: "Methodology and Composition of Sample," J.A.D.A. 45:706 Dec. 1952; "Dental Needs According to Age and Sex of Patients," J.A.D.A. 46:200 Feb. 1953; "Dental Needs According to Length of Time Since Last Visit to a Dentist," J.A.D.A. 46:562 May 1953, and "Dental Needs According to Region of the Country," J.A.D.A. 47:206 Aug. 1953.

Table 21 • Dental needs of 15,672 white males, by income and by age

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
								Teeth needing fillings								
—14	81.1	3.96	81.2	3.99	84.3	4.00	80.6	3.67	75.6	3.83	75.5	3.07	67.3	2.90	63.2	2.56
15—29	80.8	5.26	78.2	4.74	81.1	4.46	80.8	4.64	78.7	4.42	81.4	4.95	78.8	4.56	72.7	3.73
30—49	45.0	1.78	55.4	2.38	62.2	2.63	65.2	2.57	65.1	2.44	65.4	2.56	59.4	2.32	62.4	2.07
50—	14.4	.27	25.0	.73	35.8	1.05	33.6	.95	43.4	1.09	43.2	1.26	45.0	1.36	44.4	1.13
Total	58.1	3.24	63.7	3.31	69.6	3.29	68.2	3.10	66.8	2.95	65.6	2.80	60.6	2.57	57.5	2.04
Age 15 and over	53.3	3.00	59.9	3.17	65.4	3.09	64.4	2.92	64.5	2.72	62.6	2.71	58.7	2.45	56.1	1.92
								One-surface fillings								
—14	65.2	2.74	67.9	2.90	70.2	2.57	64.3	2.34	60.6	2.36	62.9	1.94	53.4	2.00	47.2	1.40
15—29	70.2	2.86	64.0	2.58	64.3	2.48	67.2	2.57	59.6	2.47	68.3	2.58	67.0	2.26	52.1	1.65
30—49	33.3	1.07	40.0	1.30	44.6	1.43	47.3	1.43	45.4	1.23	46.9	1.32	42.5	1.18	38.3	1.06
50—	6.1	.14	15.8	.45	24.6	.65	21.6	.57	29.3	.62	25.3	.59	27.3	.80	28.7	.65
Total	45.9	1.81	49.7	1.92	53.6	1.90	52.4	1.79	49.1	1.63	49.3	1.51	44.6	1.43	38.3	1.05
Age 15 and over	42.2	1.63	46.0	1.72	49.0	1.71	48.6	1.62	46.1	1.45	45.3	1.38	42.0	1.26	36.1	.96
								More-than-one-surface fillings								
—14	57.8	1.53	52.7	1.59	53.0	1.62	51.7	1.60	51.6	1.74	46.1	1.39	36.0	1.28	39.2	1.32
15—29	58.5	2.45	62.9	2.40	64.3	2.23	63.1	2.40	62.4	2.15	62.7	2.66	63.2	2.30	56.7	2.34
30—49	29.2	.76	40.4	1.15	46.4	1.30	46.1	1.24	43.6	1.27	47.3	1.35	39.1	1.18	45.2	1.06
50—	8.7	.13	13.4	.28	18.5	.40	18.6	.38	23.6	.47	29.8	.69	29.0	.56	25.5	.48
Total	40.0	1.39	47.4	1.60	49.4	1.51	47.6	1.48	48.3	1.43	45.7	1.43	39.4	1.21	38.5	1.06
Age 15 and over	36.5	1.37	45.1	1.54	48.8	1.51	46.3	1.44	47.5	1.35	45.6	1.44	40.4	1.19	38.3	.99
								Extractions because of decay								
—14	39.4	1.14	34.2	.95	28.3	.68	21.6	.54	17.1	.37	13.3	.28	13.1	.35	10.0	.21
15—29	34.6	1.08	37.2	1.31	28.9	.75	22.3	.66	18.2	.45	22.8	.61	22.9	.40	7.6	.24
30—49	32.4	1.27	28.0	1.08	22.3	.69	18.6	.62	18.3	.55	14.5	.34	8.3	.19	9.3	.21
50—	19.9	1.04	18.0	.68	17.5	.66	16.0	.68	15.9	.51	15.2	.51	12.2	.60	7.3	.20
Total	31.2	1.11	31.5	1.05	24.7	.70	19.8	.62	17.6	.48	15.8	.41	12.6	.36	8.5	.21
Age 15 and over	29.5	1.10	30.3	1.10	24.1	.71	19.3	.64	17.8	.51	16.5	.45	12.4	.36	8.2	.21

Note: "%" means the percentage of patients needing the specified dental service. "Avg." means the average need (in number of teeth except for those categories designated "One-surface fillings" and "More-than-one-surface fillings") among all patients, including those with no need. To obtain the average need among those patients needing a particular dental service, divide the average by the percentage and move the decimal point of the quotient two places to the right.

Table 21 • Dental needs of 15,672 white males, by income and by age—Continued

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
Total extractions																
—14	45.5	1.35	38.6	.96	33.8	.85	25.9	.64	22.1	.45	19.9	.45	19.8	.55	16.2	.37
15—29	42.5	1.54	48.8	1.85	38.8	1.20	31.7	1.16	30.0	1.02	33.3	.92	33.1	.85	18.0	.81
30—49	45.0	3.39	47.7	3.76	39.6	2.27	34.1	2.25	30.0	1.45	30.8	1.63	26.2	1.09	22.4	.80
50—	50.8	5.22	43.3	3.56	45.9	3.34	40.5	3.33	38.5	2.57	34.7	2.46	35.4	2.29	20.7	.91
Total	45.5	2.74	44.6	2.23	39.4	1.86	32.4	1.75	29.7	1.33	29.6	1.42	28.2	1.23	20.1	.75
Age 15 and over	45.5	3.03	47.3	2.81	40.3	2.02	34.5	2.10	31.7	1.55	32.4	1.71	30.5	1.42	21.0	.85
Periodontal treatment																
—14	.8	.21	.6	.03	.7	.05	.4	.05	.5	.02	.3	.01	.6	.04	.0	.00
15—29	5.8	.93	8.4	1.55	5.5	.92	6.6	1.01	4.0	.57	4.3	.56	3.4	.77	2.9	.31
30—49	10.5	1.53	12.1	2.05	11.0	1.52	13.0	1.78	12.5	2.08	13.2	1.80	12.1	1.58	9.1	1.30
50—	7.5	.91	7.5	.89	10.2	1.29	10.8	1.22	7.0	.73	12.2	1.52	15.5	1.74	16.2	1.88
Total	6.0	.89	7.8	1.29	6.9	.98	8.1	1.10	7.3	1.11	8.5	1.12	9.0	1.15	9.1	1.13
Age 15 and over	7.1	1.03	9.4	1.57	8.7	1.25	10.6	1.44	9.1	1.40	11.0	1.45	11.4	1.47	11.3	1.41

Complete dentures

	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
—14	.0	.0	.8	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.5	.0	.0	.0	.0	.0	.6	.0	.0	.0	.0	.0	.0
15—29	.0	.6	2.5	.4	2.5	3.1	.0	2.1	1.7	.2	1.1	2.7	.2	1.4	1.9	.4	1.3	.4	.0	.0	.0	.0	.6	1.2		
30—49	2.7	5.4	20.7	1.1	4.6	19.0	1.0	4.5	11.7	1.2	4.5	10.1	1.2	4.8	6.2	.2	4.3	6.5	.0	4.2	5.6	.0	2.8	2.2		
50—	1.5	9.5	51.2	2.7	7.0	34.3	2.4	9.0	24.1	4.2	8.7	27.0	5.5	8.7	15.5	4.5	9.4	17.8	4.2	6.3	12.7	1.7	4.6	9.4		
Total	.7	3.5	17.7	.8	2.8	10.1	.7	3.7	8.4	1.1	3.2	8.2	1.5	3.8	5.5	1.2	3.9	6.4	1.0	3.3	5.2	.6	2.6	4.2		
Age 15 and over	.8	4.3	21.3	1.1	4.1	14.6	.8	4.3	9.7	1.4	4.2	10.8	1.9	4.7	6.9	1.5	5.1	8.3	1.3	4.0	6.7	.8	3.3	5.2		

Table 21 • Dental needs of 15,672 white males, by income and by age—Continued

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
							Permanent teeth missing									
—14	14.8	.48	11.8	.24	10.3	.21	8.5	.19	6.8	.11	8.8	.15	2.4	.04	2.8	.06
15—29	53.7	2.44	58.2	3.29	55.1	2.73	56.9	2.97	51.1	2.31	42.0	2.03	30.6	.81	27.6	1.03
30—49	85.8	9.57	79.4	8.28	80.3	7.74	78.0	6.72	75.6	6.24	77.1	6.13	75.6	6.41	67.6	4.58
50—	99.2	18.94	95.9	16.96	93.7	15.39	96.4	16.13	93.5	13.50	91.3	12.37	91.8	12.88	89.0	11.72
Total	62.6	7.49	49.5	5.03	62.9	5.79	56.3	5.24	56.4	5.01	60.8	5.69	53.1	5.46	54.1	5.47
Age 15 and over	74.3	9.21	72.5	7.63	72.1	6.85	74.5	7.15	72.1	6.53	73.0	6.96	71.2	7.37	70.4	7.17
							Permanent teeth previously replaced									
—14	1.6	.05	.2	—	.5	.01	.5	—	.3	—	.9	.01	.0	.00	.0	.00
15—29	6.2	.32	12.4	.55	11.5	.47	9.8	.48	12.6	.41	5.9	.22	1.9	.02	6.6	.20
30—49	22.3	1.54	21.8	2.19	23.8	1.85	27.0	1.89	29.0	2.15	31.7	2.13	34.1	2.82	37.6	2.16
50—	30.5	4.92	31.6	4.52	41.2	6.00	40.5	5.58	52.8	6.05	45.0	5.06	51.0	6.56	60.1	6.22
Total	13.9	1.64	12.8	1.24	18.1	1.62	17.5	1.51	22.1	1.83	21.8	1.83	24.1	2.52	32.3	2.72
Age 15 and over	16.8	2.01	19.2	1.87	21.4	1.91	23.7	2.06	28.7	2.38	29.3	2.49	32.3	3.37	41.9	3.54
							No dental needs other than prophylaxis									
—14	5.3		6.2		6.0		7.6		11.1		11.2		14.3		12.0	
15—29	6.6		5.4		6.4		6.6		6.6		7.2		10.2		12.8	
30—49	4.5		6.6		6.7		7.0		9.2		9.5		12.5		14.8	
50—	5.0		4.7		5.6		6.3		6.5		8.4		13.2		15.0	
Total	5.6		5.8		6.4		6.9		8.6		9.3		12.7		14.1	
Age 15 and over	5.7		5.6		6.4		6.8		7.9		8.7		12.3		14.6	

Table 22 • Dental needs of 22,239 white females, by income and by age

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
							Teeth needing fillings									
—14	87.5	4.43	89.2	4.71	83.6	4.17	83.2	3.74	78.3	3.53	77.2	3.21	71.4	2.99	63.2	2.46
15—29	78.5	4.11	80.5	4.42	81.5	4.22	80.6	4.25	80.0	4.39	80.5	4.08	77.8	3.95	71.7	3.52
30—49	54.9	2.14	63.8	2.52	66.0	2.65	66.4	2.60	65.5	2.63	69.9	2.73	68.2	2.73	66.1	2.36
50—	28.3	.69	39.1	1.22	41.2	1.39	46.1	1.46	45.8	1.37	51.1	1.42	51.4	1.40	52.6	1.48
Total	60.1	2.77	69.8	3.37	71.1	3.29	71.1	3.15	69.5	3.01	70.7	2.90	67.3	2.74	62.6	2.31
Age 15 and over	57.4	2.61	67.5	3.21	69.7	3.11	68.2	3.01	66.2	2.92	69.1	2.82	66.3	2.68	62.5	2.27
							One-surface fillings									
—14	78.4	3.19	77.6	3.19	69.9	2.64	68.2	2.38	65.4	2.48	63.7	2.18	55.9	1.97	52.2	1.63
15—29	63.4	2.38	66.1	2.60	66.2	2.44	67.1	2.37	64.1	2.50	61.4	2.20	58.7	2.04	54.1	1.95
30—49	38.1	1.24	49.1	1.43	50.5	1.58	50.3	1.53	51.5	1.48	51.1	1.63	51.8	1.54	46.8	1.29
50—	18.2	.42	28.5	.77	34.0	.93	31.6	.91	35.5	.82	36.3	.93	38.8	.80	34.0	.90
Total	45.9	1.63	56.0	2.01	56.8	1.96	56.0	1.85	54.8	1.82	53.4	1.75	51.4	1.57	45.5	1.35
Age 15 and over	42.9	1.48	53.5	1.87	54.4	1.83	53.2	1.72	52.3	1.66	50.9	1.64	50.3	1.48	43.7	1.27
							More-than-one-surface fillings									
—14	50.9	1.85	59.2	1.97	54.5	1.80	52.1	1.55	47.5	1.62	46.7	1.43	41.8	1.40	32.2	.88
15—29	56.3	1.93	60.8	2.17	59.9	2.13	61.4	2.16	63.4	2.25	63.3	2.17	62.3	2.09	52.2	1.84
30—49	39.2	.90	42.7	1.12	44.9	1.17	45.7	1.16	42.7	1.24	48.7	1.36	45.3	1.23	43.0	1.07
50—	14.1	.27	21.8	.47	22.6	.46	26.0	.55	24.4	.56	27.5	.50	27.5	.63	29.7	.60
Total	39.8	1.21	48.8	1.55	48.7	1.51	48.9	1.44	45.8	1.45	48.0	1.41	44.1	1.31	38.4	1.01
Age 15 and over	38.7	1.16	27.6	1.51	47.7	1.46	48.1	1.41	45.5	1.41	48.4	1.40	44.7	1.29	40.1	1.04
							Extractions because of decay									
—14	43.3	1.48	35.3	.88	28.2	.71	18.9	.40	15.4	.36	15.9	.41	6.0	.11	6.3	.13
15—29	32.0	.93	25.6	.78	25.5	.74	22.7	.61	20.4	.49	13.3	.34	12.9	.27	9.6	.27
30—49	27.6	1.37	23.0	.69	19.7	.69	16.3	.52	16.2	.49	15.0	.43	12.1	.33	8.1	.19
50—	13.5	.44	14.1	.53	15.0	.58	13.0	.43	12.8	.36	14.6	.40	8.9	.27	6.2	.13
Total	25.9	.94	21.5	.72	22.5	.70	18.2	.51	16.6	.44	14.8	.40	10.5	.29	7.4	.17
Age 15 and over	25.3	.88	23.2	.70	21.4	.69	18.0	.54	16.8	.47	14.5	.40	11.5	.33	7.7	.18

Note: "%" means the percentage of patients needing the specified dental service. "Avg." means the average need (in number of teeth except for those categories designated "One-surface-fillings" and "More-than-one-surface fillings") among all patients, including those with no need. To obtain the average need among those patients needing a particular dental service, divide the average by the percentage and move the decimal point of the quotient two places to the right.

Table 22 • Dental needs of 22,239 white females, by income and by age—Continued

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
Total extractions																
—14	46.9	1.54	38.7	.99	32.3	.82	25.5	.54	21.7	.48	22.4	.59	13.7	.27	13.8	.37
15—29	42.3	1.71	37.9	1.32	36.2	1.23	33.0	1.03	29.1	.80	25.5	.72	24.5	.56	18.7	.67
30—49	45.8	3.63	36.5	1.92	32.5	1.86	29.0	1.45	29.2	1.47	28.4	1.15	22.4	1.14	17.0	.62
50—	36.6	2.92	34.0	2.27	35.2	2.33	29.9	1.91	26.4	1.32	30.7	1.88	19.0	.82	20.6	.74
Total	41.9	2.46	36.9	1.62	34.1	1.54	29.6	1.21	27.4	1.10	27.0	1.06	20.5	.82	17.5	.61
Age 15 and over	41.4	2.55	36.7	1.69	34.5	1.67	30.6	1.37	28.7	1.24	28.1	1.18	22.1	.94	18.5	.67
Periodontal treatment																
—14	.8	.20	.9	.08	.3	.03	.0	.00	.4	—	.3	.07	.0	.00	.0	.00
15—29	8.0	1.16	6.6	1.08	6.1	.95	8.7	1.42	6.9	1.13	6.6	1.06	3.1	.38	3.0	.71
30—49	11.8	1.70	11.2	1.39	11.3	1.59	12.4	1.66	12.5	1.74	11.7	1.58	13.4	1.75	13.2	1.89
50—	10.0	1.49	12.3	1.38	12.3	1.18	9.6	.93	9.0	1.07	12.5	1.27	14.3	1.72	12.7	1.84
Total	8.7	1.28	8.3	1.12	7.8	1.07	8.6	1.19	8.3	1.16	8.5	1.13	9.2	1.18	9.0	1.33
Age 15 and over	9.5	1.39	9.2	1.24	9.3	1.26	10.7	1.46	10.2	1.44	10.6	1.40	11.4	1.45	11.3	1.67
Complete dentures																
	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower	Lower	Upper	Upper and lower
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
—14	.0	.8	.0	.0	.3	.3	.0	.0	.0	.1	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
15—29	.0	2.4	3.6	.2	2.2	2.3	.2	2.4	2.5	.3	2.3	1.0	.2	1.4	.6	.0	2.0	.8	.0	.0	.0	.0	1.0	.5
30—49	2.6	6.2	16.2	2.2	5.6	8.6	1.0	6.0	7.1	.7	4.0	6.5	1.5	4.0	5.8	.7	4.8	4.1	2.3	2.5	3.9	.0	2.5	1.2
50—	4.3	8.5	30.4	7.4	8.1	21.3	4.5	8.9	19.4	3.1	8.8	13.4	3.4	5.2	16.4	2.7	5.0	9.5	3.4	5.6	5.6	1.5	3.7	6.7
Total	1.8	4.8	13.5	1.9	4.0	7.0	1.0	4.1	7.6	.8	3.4	4.6	1.2	2.8	5.1	.7	3.3	3.5	1.6	2.2	2.8	.4	2.1	2.3
Age 15 and over	1.9	5.2	14.9	2.1	4.4	7.8	1.1	5.0	7.0	1.0	4.1	5.6	1.5	3.5	6.2	.9	4.1	4.3	1.9	2.7	3.5	.5	2.7	2.9

Table 22 • Dental needs of 22,239 white females, by income and by age—Continued

Age	—$1,999		$2,000—2,999		$3,000—3,999		$4,000—4,999		$5,000—5,999		$6,000—7,999		$8,000—9,999		$10,000 and up	
	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.	%	Avg.
								Permanent teeth missing								
—14	13.2	.29	16.0	.29	12.2	.25	11.3	.22	7.0	.13	5.8	.14	9.5	.22	4.3	.09
15—29	54.6	2.49	56.5	2.35	52.9	2.36	51.0	1.90	49.5	1.94	43.1	1.40	37.5	1.12	25.0	.86
30—49	81.6	7.11	77.0	6.58	76.6	5.75	72.5	5.49	71.5	5.34	71.2	4.64	68.6	4.70	67.8	3.84
50—	88.9	14.65	86.3	13.11	84.7	11.99	78.7	10.14	85.2	11.71	80.8	9.44	80.9	9.03	80.8	8.47
Total	65.7	6.59	61.6	4.91	57.0	4.30	53.1	3.79	53.5	4.17	51.9	3.58	51.9	3.76	50.0	3.66
Age 15 and over	71.5	7.24	68.0	5.53	67.3	5.18	64.9	4.76	66.6	5.28	65.2	4.56	63.8	4.72	64.3	4.75
								Permanent teeth previously replaced								
—14	.0	.00	1.2	.01	.5	.03	.9	.08	.4	.04	.0	.00	.6	.01	.3	.01
15—29	9.4	.48	12.3	.50	13.0	.63	11.1	.54	11.8	.57	10.5	.45	9.4	.17	9.3	.39
30—49	21.5	1.61	29.7	2.32	30.5	2.18	29.3	1.94	30.9	2.01	33.7	1.96	38.9	2.38	42.6	2.37
50—	43.9	6.66	48.7	6.65	47.4	5.99	46.6	5.68	56.2	6.24	58.2	6.46	62.9	6.91	61.0	5.58
Total	20.2	2.32	21.1	1.85	20.7	1.68	19.6	1.54	22.7	1.76	24.6	1.80	29.1	2.20	32.2	2.31
Age 15 and over	22.4	2.58	23.9	2.11	25.2	2.05	24.8	1.95	28.9	2.24	31.6	2.31	37.0	2.81	42.1	3.02
								No dental needs other than prophylaxis								
—14	5.5		4.8		7.0		6.4		8.5		7.4		12.1		11.5	
15—29	6.0		5.4		6.6		7.8		6.2		7.9		12.3		10.6	
30—49	4.2		8.2		7.4		7.6		9.2		10.1		11.6		14.6	
50—	7.5		7.4		6.5		8.4		8.9		11.1		15.6		13.9	
Total	6.0		6.5		6.9		7.5		8.3		9.3		12.6		13.2	
Age 15 and over	6.0		6.7		6.9		7.8		8.2		9.7		12.7		13.7	

Table 23 • Dental needs of 9,187 white males age 18 and over, by occupational groups

Occupational group	Average age	Teeth needing fillings		Extractions because of decay		Total extractions		Complete dentures			Periodontal treatment		No dental needs*	Other dental conditions			
								Lower only	Upper only	Upper and lower				Permanent teeth missing		Permanent teeth previously replaced	
		%	Avg.	%	Avg.	%	Avg.	%	%	%	%	Avg.	%	%	Avg.	%	Avg.
Professional and semiprofessional	40.5	66.4	2.47	11.3	.29	26.1	1.07	.7	2.8	4.6	10.7	1.42	10.8	67.1	5.01	33.7	2.32
Proprietors, managers and officials, except farm	43.4	60.5	2.20	14.6	.38	28.9	1.42	1.1	4.5	8.7	12.6	1.70	10.5	76.9	7.34	36.0	3.25
Clerical, sales and kindred workers	39.4	65.1	2.76	18.3	.49	32.5	1.47	1.1	4.6	6.5	10.1	1.46	9.6	70.1	5.81	31.4	2.57
Craftsmen, foremen and kindred workers	40.2	57.4	2.52	21.4	.65	38.5	2.46	1.4	6.8	13.1	11.2	1.47	6.6	76.0	7.83	26.3	2.68
Operatives and kindred workers	37.6	58.3	2.69	26.7	.92	44.7	3.00	.8	6.6	16.5	11.1	1.75	5.0	77.7	7.93	22.1	2.05
Farmers, farm laborers and farm foremen	41.3	48.9	2.00	26.2	.88	50.1	3.16	1.6	6.8	19.0	8.7	1.34	5.7	77.6	8.67	20.7	2.01
Service workers	39.8	56.5	2.28	20.7	.67	34.6	2.05	1.0	6.8	13.1	9.8	1.13	8.2	77.9	7.91	28.9	2.97
Laborers, except farm and mine	37.7	55.9	2.66	29.1	.97	49.0	3.36	1.6	7.1	17.3	10.8	1.77	4.6	76.3	8.05	17.0	1.64
All occupations	40.2	60.0	2.48	20.0	.61	36.6	2.11	1.1	5.3	11.1	10.8	1.53	8.1	74.1	7.04	28.2	2.47

*Other than prophylaxis.

Note: "%" means the percentage of patients needing the specified dental service. "Avg." means the average need (in number of teeth) among all patients, including those with no need. To obtain the average need among those patients needing a particular dental service, divide the average by the percentage and move the decimal point of the quotient two places to the right.

The dental needs of men according to occupational group are presented in Table 23. In general, it may be said that these statistics are consistent with and tend to confirm the findings on dental need according to income. Although the number of teeth needing fillings did not vary much according to occupation, the number of teeth already missing or indicated for extraction was considerably higher in the low income than in the high income occupational categories.

When the total of teeth missing and needing extraction was used as an index of mouth health, professional and semi-professional men ranked first (6.08 teeth); and farmers, farm laborers and farm foremen ranked last (12.13 teeth). Between these extremes, occupational groups were arranged as follows: clerical, sales and kindred workers (7.28 teeth); proprietors, managers and officials, except farm (8.76 teeth); service workers (9.96 teeth); craftsmen, foremen and kindred workers (10.29 teeth); operatives and kindred workers (10.93 teeth) and laborers (11.41 teeth).

Table 24 • Average number of teeth missing or requiring extraction for males in selected occupations

Occupation	Number of patients	Average age	Average number of teeth
Clergymen	111	43.4	7.70
Dentists	17	45.5	3.93
Executives	165	47.5	5.90
Lawyers and judges	127	44.5	5.38
Physicians and surgeons	143	41.9	4.90
Teachers	186	37.4	4.44

The average ages of these occupational groups are given in Table 23. In some instances age is the apparent explanation when an occupational group deviates from expectation with respect to dental needs or number of teeth missing.

Unfortunately only 17 dentists were included in the 9,187 white males over 17 years of age for whom occupation was given. Table 24 shows that these dentists had lost fewer teeth than men in other occupations of comparable socioeconomic status.

B. Duane Moen, Director

COUNCIL ON DENTAL RESEARCH
COUNCIL ON DENTAL THERAPEUTICS

Joint statement of the Council on Dental Research and the Council on Dental Therapeutics on Listerine Antizyme toothpaste*

The American Dental Association has been informed that Listerine ANTIZYME toothpaste is to be presented to the public, beginning August 20, with a widespread advertising and publicity campaign. Some information indicates that the advertising may suggest to the casual reader that the product's effectiveness in preventing dental decay is such that standard dental health procedures can be disregarded by the individual using the dentifrice. Technical statements may lead the reader to infer that adequate tests have demonstrated the validity of this assumption.

In order to provide the dental profession and the public with proper information in this matter, the Council on Dental Research and the Council on Dental Therapeutics of the American Dental Association have attempted to ascertain the basis for the claimed effectiveness of this new dentifrice.

It is the opinion of the Councils that all preparations designed to reduce the incidence of dental decay in humans should be evaluated by direct clinical measurements. Antidecay claims are not justified for products until their effect in actually reducing human dental caries has been directly demonstrated by acceptable controlled studies of human population groups. The Councils have not been able to obtain any evidence that clinical data are available to substantiate such claims for the new Listerine dentifrice. The only available report is based on laboratory findings.

It is the opinion of the Councils, therefore, that on the basis of the evidence presently available, actual or implied claims of antidecay qualities for the new Listerine dentifrice are premature.

It is the further opinion of the Councils that it is contrary to the public interest to suggest that the use of any dentifrice may be substituted for well-recognized dental health procedures.

The Councils continue to advise all individuals to avoid excessive consumption of sugar-containing preparations which have been demonstrated to be related to the development of carious lesions.

The Councils believe also that presently available evidence indicates that conscientious toothbrushing immediately following the ingestion of sugar products should continue to be recommended as an individual procedure to reduce dental caries.

In summary, the Councils suggest that both the dental profession and the public adopt a conservative attitude toward any new product for which therapeutic claims have not been conclusively demonstrated by acceptable controlled clinical studies.

*Statement issued, August 11, 1953.

BUREAU OF LIBRARY AND INDEXING SERVICE

The American Dental Association Film Library

The films reviewed in this article have been added to the Film Library collection. Since the two films on anesthesia are being shown on the motion picture program of the annual session, dental society program chairmen, dental school faculty members, and hospital dental training chiefs will have an opportunity to preview them for possible use in their respective programs. They may be rented for $2.50 each from the Film Library. Since the number of prints is necessarily limited, it is suggested that program chairmen plan their programs far enough in advance to insure availability.

FILM REVIEWS

Vinethene in Dentistry • 16 mm., color, sound, 1,400 ft., showing time 30 minutes. Produced in 1953 by Merck and Company under the technical supervision of E. A. Rovenstine, professor of anesthesiology, New York University Postgraduate Medical School, and director of anesthesia, Bellevue Hospital. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago 11, or on loan from Merck and Co., Rahway, N. J.

This film shows the employment of the inhalation anesthetic agent, Vinethene, by itself and also as a complement to nitrous oxide-oxygen. The film opens with a discussion and an illustration of the armamentarium used in the first method, such as a face mask, several layers of gauze, and Vinethene. Each bottle has its individual cap and dropper so that the administration can be controlled by the operator. The effects of overdosage are demonstrated on animals. When ethyl chloride is used on the animal, the respiration and pulse become irregular after 3 minutes. After 5 minutes, there is a crisis in the cardiac condition, and after 6 minutes, the animal is dead. Artificial respiration in such cases is unsuccessful. According to other experiments, however, when Vinethene is used, the pulse remains regular throughout induction and after 7½ minutes, respiration decreases markedly, but the pulse remains steady. The animal is revived by artificial respiration.

This is followed by a series of demonstrations on the administration of Vinethene to patients. The demonstrations take place in a general practitioner's office with Dr. Rovenstine, the anesthetist, as operator. The method of induction is discussed in each case. It is obvious that the psychological approach to the patient is as important as the administration of the Vinethene. The hazards, such as increase in glandular action and the possibility of laryngeal spasm, are noted.

This film is well organized and well photographed. The use of animation and the repetition of the technics involved make it an excellent teaching film. It is suitable for use in dental schools in a course on anesthesia or as stimulating program material for dental societies and hospital dental staffs.

Local Anesthesia in Dentistry • (Part I, Mandibular Considerations) 16 mm., color, sound, 1,200 ft., showing time 30 minutes. Produced in 1953 by the Department of Visual Education, College of Medical Evangelists School of Dentistry, with the cooperation of Niels Bjorn Jorgensen and John Hughes, M.D., Department of Anesthesiology, College of Medical Evangelists. Production assisted by a grant from Cook-Waite Laboratories, Inc., New York. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago 11, and on loan or purchase from the College of Medical Evangelists School of Dentistry, Los Angeles.

This film presents demonstrations of accepted nerve blocks and infiltrations. For complete orientation each demonstration is first shown on a skull, then on a dissection and finally on a patient while the narrator slowly discusses the anatomy and method of injection and traces the path of the needle. The anterior view of the specimen reveals the mucous membrane, glandular tissue, temporal muscle and crest, buccal nerve and tendon. The lateral view shows the parotid gland with duct exposed, the masseter muscle detached from the zygomatic arch, the anterior border of the ramus, and the buccinator muscle. Animated drawings repeat the method of insertion and

trace the path of the needle. Reasons for failure in injections are also discussed. The film concludes with a summary.

This film is not concerned with any technics in the administration of a local anesthetic but with presenting generally accepted technics for teaching purposes. It is well organized although it might be considered too long and repetitious in parts. The use of diagrams, animated drawings, models, specimen and patient adds to its instructional value. The photography and lighting are good. General practitioners, dental students, and hospital dental staffs may find it interesting. It may be too elementary for dental society programs.

Alveolectomies • 16 mm., color, silent, 500 ft., showing time 20 minutes. Produced in 1947 by Maxwell P. Chodos, D.D.S. Photography by Harry L. Coleman. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago 11, and from Dr. Chodos, 246 West End Ave., New York.

This film opens with a demonstration on models of the steps involved in an alveolectomy for the correction of congenital hypertrophic osteitis. The upper and lower jaws are shown with dentures *in situ;* impressions are taken; alveolectomies are performed; and, finally, immediate dentures are inserted. Prior to the actual performance of these steps on the patient, a method is presented for controlling bone hemorrhage caused by surgical exposure of nutrient vessels in the cancellous portion of the bone. The same steps are then performed on the patient. The film concludes by showing postoperative views of the patient with dentures in position.

The film, although silent, has legends which make it self-explanatory. It is well organized and is suitable for postgraduate teaching and study clubs. The photography is good and enables the viewer to see all the intraoral operations clearly. Postgraduate students, hospital dental staffs, oral surgeons, general practitioners and prosthodontists may find it interesting.

Report of the United Kingdom mission on fluoridation in North America

The British mission which surveyed fluoridation projects in the United States during February-April 1952 has recommended that the adoption of fluoridation be considered in the United Kingdom in a 98-page report recently published by the Government.

The mission was composed of Jean R. Forrest, dental officer, Ministry of Health; J. Longwell, principal scientific officer in the Department of the Government Chemist, in charge of examination and treatment of water; H. H. Stones, professor of dental surgery and director of dental education, University of Liverpool; A. M. Thomson, research lecturer in the Department of Midwifery, University of Aberdeen. The following are excerpts from the report:

Study Areas Visited • The areas visited where studies of dental caries in its relation to fluoridation are in progress were: Grand Rapids, Michigan; Newburgh, New York; Brantford, Ontario; Sheboygan, Wisconsin; Marshall, Texas; and Evanston, Illinois. In each area the fluoride concentration of the drinking water has been raised to between 1.0 and 1.2 p.p.m. by the addition of sodium fluoride.

Results of Fluoridation Studies • In all the studies the teeth are carefully examined for any sign of dental fluorosis (mottled enamel), but in only very few instances has it been found. Even then it has occurred only as an occasional small white fleck on a cusp of a permanent molar or premolar, or on the biting edge of a permanent incisor. Otherwise the teeth are unaffected and we confirmed this by personal observation. It is unfortunate that some term other than "fluorosis" has not been found to describe this condition as the name implies a defect. We consider that such small changes in the enamel surface, changes which may occur also from some other cause, and are detectable only by a trained observer, cannot be considered a disadvantage even aesthetically.

In Marshall, Texas, the water is fluoridated to a level of 1 p.p.m. Marshall is in the southernmost State, and has a much higher average day temperature and a greater degree of humidity than have any of the other study areas. It was anticipated that water consumption would be much greater than in the temperate areas so that the intake of fluoride would be considerably more. This may be so, but the effect on the teeth did not appear to be different from that noted in the other study areas.

An Appraisal of the Results • The reported results of the studies leave no doubt that an important reduction in the incidence of dental caries has occurred among younger children as a result of 4 to 6 years fluoridation; that taking into account the time factors concerned, these results are very much those which would have been predicted from the epidemiological surveys; and that the dental benefits are not accompanied by any undesirable manifestations of dental fluorosis.

Had these conclusions been derived from a single investigation there might have been room for scepticism; but the striking similarity in the results of several wholly independent enquiries in widely separated areas puts the matter beyond reasonable doubt. The possibility that the conclusions reached have been influenced materially by biased examination of the teeth can, in our opinion, be discounted (Appendices 3, 4, 5 and 6).

Long Term Prospects of Fluoridation • In the light of all these findings there can be little doubt that fluoridation will reduce the incidence of dental caries very substantially, not only among children, but also among adults. However, it should be emphasized that fluoridation is not a "cure" for dental caries, and it is not known whether it retards the progress of existing caries. Older children and adults brought up in areas where the water has not contained fluoride cannot expect much direct benefit from fluoridation, which must therefore be regarded as a long term measure. Some individuals who are particularly susceptible may develop severe dental caries despite life-long consumption of fluoridated water.

Epidemiological Evidence of Harmlessness • There is no evidence that such naturally fluoridated water differs in any way which is of biological significance from water to which fluorides have been added. Furthermore, chemical evidence indicates strongly that in both kinds of water (naturally and artificially fluoridated) the fluorides at the concentrations concerned are completely ionized; in other words, it is the fluoride ion which is important and not the kind of fluorine salt from which the ion is derived. If it is accepted that artificially and naturally fluoridated waters have

the same biological effects, then evidence of benefit or harm can be derived not only from experience following the addition of fluorides to water, but also from the health experience of the vast number of people who have always consumed water with a high natural fluoride content.

Yet, no definite evidence has been forthcoming that the continued consumption of fluorides at a level of about 1 p.p.m. is in any way harmful to health. This is an impressive fact and one which in our opinion, makes it quite certain that if any untoward effect is revealed by future research it will be of a relatively trivial order. However, the opinion held by a minority of American scientists that fluoridation policies should not be actively pursued until further research into possible hazards has been undertaken, may be noted. It has been said that fluoridation involves a degree of "calculated risk." The authorities and communities concerned must decide for themselves what degree of risk is worth accepting. We do not wish to take sides in this matter of opinion, but merely to assert the fact that no risk is at present known to exist. If a risk exists at all, it is so inconspicuous that it has not been revealed by many years of investigation. Millions of people are living in ordinary good health on water containing fluoride in the amounts recommended for caries control (or more), so that the fluoridation of other waters involves no new experience in human welfare.

Summary and Conclusions • In our opinion the evidence is conclusive that among children in fluoridation areas there is a reduction in the incidence of dental caries to a level comparable with that experienced where fluoride occurs naturally in the water. To date, a reduction of this extent has been demonstrated only among children up to 6 years of age, because no fluoridation scheme has been in progress for more than 7 years. Data relating to older age groups are as yet insufficient to warrant firm conclusions.

Recommendations • It follows from our conclusions that we consider fluoridation to be a useful means of reducing the incidence of dental caries in North America. It is reasonable to assume that it would also be useful in this country. We therefore recommend that its adoption in this country should be considered. However, certain investigations are desirable before the general adoption of fluoridation.

In our opinion it would be advisable in the first instance to add fluoride to the water supplies of some selected communities. These preliminary fluoridation projects should be regarded as study centers and include full medical and dental examinations at all ages.

In spite of the fact that the evidence of harmlessness is so strong as to be almost conclusive, research into the effects on health and disease of the continued use of waters containing low levels of fluoride should be encouraged.

APPENDIX COMMENT

Dental Examinations Made by Members of the Mission • In all, 352 children were examined [by dental members of the mission] in the different study centers and 72 in control areas. When it could be arranged examinations were made by both British and American observers working independently.

In all the study centers close agreement was obtained on clinical examination between the findings of the British and American observers. This was especially the case for "objective caries," that is, caries involving the dentine. There was some difference of opinion on lesions which involved only the enamel. In current English surveys these are classified as carious but in most of the American studies they are not included.

Mottled Enamel • Among all the children examined only those in areas where fluorides occurred naturally in high concentration in the drinking water had noticeably mottled teeth.

At a level of 1.0 to 1.2 p.p.m. the teeth were well-formed and "questionable" or "very mild" mottling was seen in a very small proportion of the children at all ages. This was so inconspicuous that it could not have been detected if the teeth had not been examined for this specific purpose and certainly would not ordinarily have been noticed.

Assessment of Dosage • The available evidence suggests that the level of fluoridation of water appropriate for the United Kingdom will not differ greatly from that which has already been adopted in the United States.

Cost of Fluoridation of Water • It is clear that it is more economical to add fluorides to water supplies which are used by the entire population than to give topical applications of solutions of sodium fluoride to the children. Apart from the saving in money there is also a saving in dental manpower which is of great importance and, furthermore, the benefits to be derived by the children are also greater with fluoridated waters and these may well be of a more permanent nature.

LON W. MORREY, D.D.S., EDITOR

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Editorials

Profession awaits clinical proof that new antienzyme dentifrice will prevent dental caries

Claims for a dentifrice of a new and presumably different type which was launched late last month are being received by the profession and the public with a mixture of hope and skepticism—hope that at last a dentifrice has been formulated that will prevent decay in human teeth and skepticism born of hundreds of similar claims for hundreds of similar products, none of which has ever materialized. A report on the product and a joint statement concerning it by the Council on Dental Research and the Council on Dental Therapeutics are published on pages 365 and 349 of this issue.

The superiority of the new dentifrice, according to its promoters, lies in an antienzyme which penetrates the dental plaque and for long periods of time prevents the formation of acids from fermentable carbohydrates.

Several studies have been made, including one just published,[1] which indicate that the daily use of a dentifrice or mouthwash containing enzyme inhibitors decreases the rate of acid formation on tooth surfaces for a number of hours. The manufacturers who financed these studies, more trained in commerce than in science, conveniently assume that compounds which prevent the formation of acids will *ipso facto* prevent dental caries.

This assumption is unwarranted as there is no acceptable evidence to date demonstrating that the daily use of such a dentifrice will prevent dental caries, although studies on the subject are now being made.

1. Fosdick, L. S. and others. A new approach to the problem of dental caries control. J. D. Res. 32:486 Aug. 1953.

In light of these facts and in an effort to keep members of the profession informed of the latest developments in the dental health field, the Association has issued the following statement:

The ultimate value of any agent for the prevention of tooth decay must be determined by direct observation of the actual reduction of tooth decay in humans under carefully controlled and scientifically acceptable conditions.

While the idea contained in this report that antienzyme substances can be added to a dentifrice to prevent the formation of decay-causing acids in the mouth is not new, it continues to be an interesting suggestion. The value of antienzymes in preventing tooth decay among humans still remains to be demonstrated. All available data to date are based on laboratory findings.

Hope always prevails that some day, somehow, someone will discover a true preventive for dental caries, and this dentifrice may be it. If time and research prove that it is, those responsible for its discovery will receive everlasting gratitude for their contribution to the health and happiness of the human race. At the same time, should the claims vanish in thin air as have so many claims for so many similar products in the past, the promoters who have raised false hopes and misled the public will deserve everlasting condemnation for the damage which they, in their haste, will have done.

In view of the long and unhappy history of miracle dentifrices, it is predicted that the current nation-wide promotional campaign will cause little more than a ripple on the sea of superlatives that have surrounded the dentifrice field since the days of Pliny and Galen. Dentists, of course, will wisely withhold judgment of the product until scientific evidence proves its worth or its worthlessness, and it is hoped that the intelligent consumer will do likewise.

British scientists report favorably on benefits of water fluoridation

Should the recent recommendations of four eminent health authorities from Great Britain be adopted reasonably soon, the dental health of British children, beginning at least with the next generation, will be considerably better than that of their fathers. The United Kingdom scientists, following an intensive three months' survey last year of water fluoridation projects in the United States and Canada, recommend that this preventive measure be considered for adoption in Great Britain. Excerpts from the researchers' ninety-eight page report, entitled "The Fluoridation of Domestic Water Supplies in North America," are published on page 352 of this issue of THE JOURNAL.

The overseas scientists conclude, on the basis of their investigations including the examination and study of six major fluoridation projects in the United States and Canada that: (1) The fluoridation of the public water supply to the extent of 1 ppm will, without doubt, reduce the incidence of dental caries materially; (2) no evidence exists of difference in the biological effect of so-called artificially fluoridated water from that of naturally fluoridated water, and (3) no evidence exists of harm to the health from the continued consumption of fluorides at a level of about 1 ppm.

The researchers take into full account the opinions of those who would stop further fluoridation until still more research is amassed to show that the process is harmless to health. They discount those opinions, however, by observing that millions of people live long and healthily even though, through the necessity of circumstance and environment, they drink only water with a higher fluorine content than is recommended for the control of caries. It is apparent that the members of the British Mission, like their American colleagues, have found no evidence that the continued consumption of water containing 1 ppm of fluorine is in any way harmful, and they observe that should future research reveal such effect, it would certainly be trivial in nature.

The investigators, employing the understandable precaution of scientists, accentuated perhaps by native British prudence, temper their recommendation by advising that certain preliminary procedures be carried out in order to adapt fluoridation to the United Kingdom. Chiefly they advise the establishment of preliminary studies in communities in which the effects of the process on both general and dental health can be determined under conditions peculiar to Great Britain. Fortunately there are communities in Britain including North Shields,[1] South Shields and Maldon,[2] where the effects of fluorides in drinking water may be studied under natural conditions.

Dentists, health workers, civic authorities and others in this country, whether they approve or oppose the process of fluoridating communal drinking water, should read this short, terse and unbiased report which may be obtained from Her Majesty's Printing Office, London, England, for five shillings (35 cents) net. Although the observations and recommendations of its authors corroborate the findings of practically all American researchers who have studied the subject, it may be anticipated that some of the paragraphs in the report will be twisted, distorted and used out of context by opponents of the measure in a vain effort to prove their point.

1. Weaver, Robert. Fluorosis and dental caries on Tyneside, Brit. D. J. 76:29 Jan. 1944.
2. Ainsworth, N. J. Mottled teeth, Brit. D. J. 55:233 Sept. 1933.

Association membership nears saturation point

Membership in the Association continues to increase perceptibly each year as is frequently reported in THE JOURNAL. As of July 21, membership totaled 78,842, the highest in history and approximately 3,000 more than on the same date last year. An increase of 3,000 members or four per cent may seem so slight as to warrant no mention, but considering that approximately eighty per cent of the dentists in the United States already are members of the Association and considering also that membership is not compulsory as in some organizations, a four per cent increase is gratifying and represents hours of time and toil on the part of membership committees. The Council on Membership deserves the highest credit for the membership record of the Association as it is responsible directly or indirectly for fully two thirds of the growth in members. Other factors, of course, have contributed, the most important of which is the increase in the annual number of graduates.

Although it may be assumed that the present level of membership will continue, it is doubtful that a sizable increase is possible in the immediate future. True, the number of graduates entering the profession annually is almost twice that of a decade ago, yet against the annual profit of 2,900 to 3,000 new members must be entered the loss of some 1,800 through death and retirement. This leaves an over-all gain of 1,100 to 1,200, not all of whom may meet the rigid ethical standards of the Association.

While the prospects for an increased membership are not bright, neither are they black. In analyzing its problems during the past year, the Council on Membership recognizes that there are at least three areas in the profession which, if cultivated thoroughly, should produce additional members; (1) the undergraduates, (2) the recent graduates and (3) dentists in the federal services.

Of the 12,370 students enrolled in United States dental schools during the past academic year, 9,539—a high percentage—were Association student members. If the remaining 2,831 prospects, however, were enrolled as enthusiastic student members, their chances of becoming fully privileged members later would be greatly improved. One way to increase student membership is to maintain a dynamic Association student organization in each dental school. At present but 14 of the 42 dental schools have such organizations. Another way is for the dental societies in the locality of the dental schools to invite undergraduates to participate in and contribute to the society meetings. Four years of such participation will motivate most graduates to become active members.

Too many graduates are lost to membership during their first year in practice. Only seventy per cent of the 1951 student member graduates became active members of the Association in 1952. The Council on Membership urges that constituent and component societies extend their efforts to enroll recent graduates as soon as they secure a license to practice. Such action will react beneficially to the society as well as to the young member. For example, as a result of a House of Delegates' action in 1952 which permitted constituent societies to accept student member graduates as active members, eight societies secured sufficient additional members to entitle them to one additional delegate, and two societies gained two delegates.

The third area which justifies careful cultivation is the federal dental services. Only fifty-nine per cent of the dentists in the United States government agencies hold membership in the American Dental Association. The percentage varies as follows: Air Force, fifty-eight; Army, fifty-two; Navy, sixty; Public Health Service, eighty-eight; and Veterans Administration, seventy-seven. Considering the years of hard and usually successful effort spent by the Association on behalf of dentists and dentistry in all branches of the federal service, it would seem that every member of the profession in those services would demand the right and privilege of contributing his bit toward further improvement of his working conditions and facilities.

The Council on Membership is to be congratulated on the years of sustained effort which have enabled it to accomplish its over-all objective. It is to be congratulated for its more recent efforts in analyzing its problem and uncovering weak areas in its program. Its next job is to cultivate those areas so as to produce a greater crop of fully privileged active members.

Washington News Letter

The Veterans Administration's fee-basis dental care program is undergoing a violent upheaval as the result of a White House economy order and restrictions imposed by Congress. In consequence, VA services performed this year by private practitioners—some two thirds of whom are participants in the VA "home town dental care" program—probably will register the lowest volume since World War II.

A few weeks ago President Eisenhower ordered all executive departments and bureaus to effect rigid economies. For the current fiscal year Congress appropriated $23,000,000 to be used for fee-basis dental care for veterans. A large portion of that sum, however, may be withheld by the VA because of the President's directive.

What Congress did, for its part, was to insert a "rider" in the VA appropriations bill which places a formidable obstruction in the path of outpatient dental services. Its effect is this: As of July 1, there were 247,000 veterans whose applications for dental treatment had been approved and who were on waiting lists. Now, however, their applications must be processed all over again to determine whether the dental defects actually existed at the time of their discharge from military duty.

In addition, there will be a more stringent screening of nearly 100,000 other applications that are pending. Certification for care will be given only if it can be proved that the dental disabilities are service-connected, or that they are aggravating a service-connected physical disability or injury. Dental disabilities which occur within a year after discharge will no longer be presumed to be service-connected.

Reps. Edith Nourse Rogers and Peter Frelinghuysen, Jr., attempted unsuccessfully to have legislation enacted before adjournment of Congress that would have reserved the eligibility of Spanish-American War veterans and disabled veterans in vocational rehabilitation programs. Previous laws established the eligibility of both groups to outpatient dental care regardless of the condition's service-connection.

One of the controversial proviso's effects is to prohibit outpatient dental care—unless it is adjunct treatment—for the Spanish-American War Veterans. This in spite of the fact that Congress, a few years ago, passed a law conferring unlimited medical and dental outpatient treatment benefits upon these veterans, regardless of whether the condition was service-connected. An estimated 73,000 of them survive today. None can prove that dental defects are service-connected, since records of this kind were not kept 55 years ago. In fact, even World War I dental records are fragmentary and undependable, making it extremely difficult for a veteran of that period to prove service-connection.

On the basis of a few samplings that have been made, John Fauber, head of VA dental services, estimates that about 50 per cent of the 247,000 applications that were certified for eligibility prior to July 1 will be rejected because actual service-conection cannot be proved.

OTHER WASHINGTON MATTERS

The House Ways and Means Committee conducted public hearings in mid-August on proposed legislation that would permit dentists and other self-employed persons to channel a limited portion of their

annual income into voluntary retirement plans on a tax-deferred basis. A statement supporting such a program was filed with the committee by Paul E. Jones of Farmville, N. C., in behalf of American Dental Association. Dr. Jones is a member of the Council on Legislation.

The committee chairman, Rep. Daniel Reed (R., N. Y.), did not indicate what action would be taken on the proposal. No decision will be reached before the opening of Congress in January.

Chester Scott Keefer, professor of medicine at Boston University, was sworn into office on August 12 as special assistant to the Secretary of Health, Education and Welfare in charge of health and medical affairs. His nomination to the post by President Eisenhower came only a few days before adjournment of Congress.

He will be top policy adviser to Secretary Oveta Culp Hobby on all health matters within the department. His jurisdiction encompasses not only the Public Health Service, with its dental public health and dental research responsibilities, but also the Social Security Administration, Office of Vocational Rehabilitation, Office of Education and St. Elizabeths Hospital.

President Eisenhower, by his recent message recommending extension of social security coverage to self-employed dentists, physicians, lawyers and other professional people, has triggered what promises to be a great battle on this issue in the 1954 session of Congress.

An Administration bill embracing details of the Chief Executive's message was introduced in the House on the closing day of Congress by Representative Reed. He made it clear, however, that he is not necessarily in favor of the plan to add more than 10,000,000 citizens to the social security rolls.

Twenty-four dental graduates of the class of 1953 have been chosen for internships in naval hospitals. All have been commissioned as lieutenants (junior grade) and assigned to duty as follows:

To Naval Hospital, Portsmouth, Va.—Joseph M. Kelley, Washington, D.C., and Benford L. Samuels, Oxford, Miss.

To Naval Hospital, St. Albans, N. Y.—Thomas J. Hartland, Philadelphia; Herman Kaplan, New York, and Donald Kwait, East Cleveland, Ohio.

To Naval Hospital, Great Lakes, Ill.—Howard C. Mitchell, Louisville; Roscoe P. Hylton, Jr., Minneapolis, and Robert L. Moore, Greenfield, Tenn.

To Naval Hospital, San Diego—Robert E. Christenson, Milwaukee; Niles F. Guichet, Baton Rouge, La., and Harry J. Riffle, Kansas City, Kas.

To Naval Hospital, Oceanside, Calif.—James Fritsche, Milwaukee, and Stanley P. Hazen, Parkers Prairie, Minn.

To Naval Hospital, Philadelphia—Robert D. Cullom, Nashville; Herbert A. Fink, Union City, N. J., and Julian J. Thomas, Nashville.

To Naval Hospital, Corona, Calif.—Gordon D. Anderson, Rockford, Ill.; Earl A. Ewen, Donaldson, La., and Robert G. Thompson, Iowa City, Iowa.

To Naval Hospital, Oakland, Calif.—Maurice R. Bjerken, Minneapolis; Lorenz F. DeJulien, Jr., Lamesa, Calif., and Leon E. Schnieder, St. Cloud, Minn.

To Naval Hospital, Chelsea, Mass.—James Markwood, Washington, D.C., and Norman M. Starosta, Webster, Mass.

Rear Adm. Lamont Pugh, Navy Surgeon General, has anounced that the Navy's annual medico-dental military symposiums will be held October 12-14 at the Chelsea Naval Hospital and October 19-24 at the Philadelphia Naval Hospital.

Dental reservists wishing to enroll should request duty orders, without pay, from the commandants of their home naval districts. Point credits will be awarded to enrollees, on the basis of one point for each day of attendance.

SOCIAL SECURITY, REDISTRICTING OF ASSOCIATION TO BE CONSIDERED AT 94th ANNUAL SESSION

President Eisenhower's recent recommendation that Social Security provisions be extended to dentists will be debated by the House of Delegates at the 94th annual session of the Association September 28-October 1 in Cleveland.

A resolution paralleling the President's proposal has been submitted for the consideration of the House of Delegates by the Wisconsin State Dental Society. The subject previously was studied by the House in 1949 and 1952; on both occasions the inclusion of dentists in Old Age and Survivors' Insurance was disapproved.

The House of Delegates also will act on resolutions concerning the redistricting of the Association, changes in the Veterans Administration hometown dental care program, dental prepayment plans and direct membership in the Association for dentists in the Armed Forces.

Meetings of the full House are scheduled for Monday morning and afternoon, Wednesday afternoon and Thursday afternoon. Reference committees of the House will receive their assignments Monday afternoon and will hold hearings all day Tuesday.

GUEST SPEAKERS

Guests who will address the 94th annual session of the Association will include Nelson A. Rockefeller, Under Secretary of the Department of Health, Education and Welfare, and Howard A. Rusk, chairman of the National Advisory Committee to Selective Service and the Health Resources Committee of the Office of Defense Mobilization.

Mr. Rockefeller formerly has served in the government as coordinator of Inter-American Affairs (1940-44), Assistant Secretary of State (1944-45) and chairman of the International Development Advisory Board of the Point Four Program (1950).

N. A. Rockefeller

Mr. Rockefeller will be the guest speaker at the general meeting of the annual session, to be held Tuesday evening, September 29.

Dr. Rusk, an eminent medical specialist in rehabilitation, will address the closing session of the House of Delegates at 1 P.M. Thursday, October 1.

Dr. Rusk is professor and chairman of the department of rehabilitation and physical medicine at New York College of Medicine, associate editor of the *New York Times* and consultant in rehabilitation to the New York City Hospital, United Nations Secretariat and the VA's Baruch Commission on Physical Medicine.

When the Office of Defense Mobilization organized its Health Resources Advisory Committee in August 1950, Dr. Rusk was chosen chairman. The Com-

The Cleveland Public Auditorium (above) will be the site of scientific and commercial exhibits at the Association's 94th annual session, to be held September 28-October 1 in Cleveland. The House of Delegates will meet at the Statler Hotel and the scientific sections at the Hotel Cleveland.

mittee was later designated to serve as the National Advisory Committee to the Selective Service System on the "doctor draft" law with Dr. Rusk continuing as chairman.

TUESDAY EVENING CONCERT

A program of classical music will be presented before the General Meeting Tuesday evening. The Cleveland Little Symphony, under the baton of Louis Lane, will present concert selections from 7:30 to 8:30 P.M. in the Grand Ballroom of the Statler Hotel.

REFERENCE COMMITTEE

Following are the standing committees which have been appointed by President Otto W. Brandhorst for the 1953 annual session:

Constitution and Bylaws • Max E. Ernst, chairman, St. Paul; Jacob Feinman, Staten Island, N. Y.; J. D. O'Farrell, Houston, Texas; E. B. Penn, Miami, Fla., and C. E. Peterson, Rockville, Conn.

Credentials • Paul W. Zillmann, chairman, Buffalo; Robert J. Pollock, Chicago, and Allyn F. Sullivan, Providence, R. I.

Rules and Order • J. M. Donovan, chairman, Neenah, Wis.; H. D. Butts, Jr., Pittsburgh, and J. Guilford Sharp, Knoxville, Tenn.

Reference committees appointed by President Brandhorst for the annual session are:

Dental Education • W. N. Hodgkin, chairman, Warrenton, Va.; Wesley B. McCall, Temple, Texas; W. Wayne White, Kansas City.

Dental Research and Dental Therapeutics • Fred O. Pitney, chairman, Oklahoma City, Okla.; Wilbur P. McNulty, Fort Wayne, Ind.; William S. Smith, San Francisco.

Federal Dental Services • Rulon W. Openshaw, chairman, Los Angeles; C. J. Baumann, Sr., Milwaukee; T. P. Fox, Philadelphia.

Hospital Dental Service • William Ryder, Jr., chairman, San Francisco; Earle S. Arnold, West Hartford, Conn.; D. C. McRimmon, Fort Worth, Texas.

Insurance • Donald R. Mackay, chairman, St. Paul; Clyde R. Flood, Seattle; John A. Zwisler, Kankakee, Ill.

Legislation • William A. Giblin, chairman, Montclair, N. J.; G. R. Brooks, Rochester, Mich.; D. W. Wilson, Belle Plaine, Minn.

Miscellaneous Business • E. L. Pessagno, Jr., chairman, Baltimore; Wilbert J. Jackson, Clinton, N. C.; L. E. Myers, Omaha.

Public Health • Theodore C. Blutau, chairman, Rochester, N. Y.; Walter A. Crum, Richmond, Ind.; Floyd A. Sandberg, Honolulu, T. H.

Reorganization of Trustee Districts • Harold E. Tingley, chairman, Boston; Willard S. Bell, South Ozone Park, N. Y.; John B. Wilson, Los Angeles.

Report of President • E. N. Bach, chairman, Toledo, Ohio; P. E. Bomberger, Lancaster, Pa.; Raymond E. Myers, Louisville, Ky.

ELECTION OF TRUSTEES

Trustees will be elected for the Third, Fourth, Fifth, Eighth and Ninth Districts, as the three-year terms of trustees from these districts—W. Earle Craig, Daniel F. Lynch, James E. John, L. H. Jacob and Obed H. Moen—end this year.

DENTAL HEALTH CONFERENCE

Dental health programs in industry—preventive programs sponsored by management and health care programs sponsored by labor unions—will be discussed at the annual Dental Health Conference of the Council on Dental Health, to be held Saturday, September 27, at the Statler Hotel.

In the morning session of the Conference an industrial dentist, an industrial physician, a representative of the National Association of Manufacturers and a Council member will speak on health programs sponsored by management.

The speakers will describe the operation of industrial dental health programs, their objectives, the role of management and the recommendations of the Council regarding the programs.

The afternoon session on health care programs of labor unions will be presented by representatives of two labor unions and a member of the Council. Subjects under discussion will be the interests of labor and the dental profession in the union health program and methods by which personal health services, including dentistry, may be provided to union members.

General discussion periods will climax both the morning and afternoon sessions, which will be open to all interested Association members and guests.

STATE SOCIETY OFFICERS

A panel discussion on modernizing a dental society's bylaws will open the State Society Officers Conference, which will be held Sunday, September 27, from 9 A.M. until 5:30 P.M. at the Hotel Statler.

Participants in the panel discussion will include John R. Abel of Beverly Hills, Calif., moderator; Harold Hillenbrand of Chicago, Harold W. Oppice of Chicago and Percy T. Phillips of New York.

Guest speaker at the Conference luncheon will be Warren Guthrie, professor of speech at Western Reserve University, whose subject will be "Making Phrases at Each Other."

Other subjects to be discussed at the Conference are the VA dental program, investment of society funds, insurance programs, information technics, grievance committees and a program for smaller state societies.

Officers of the organization are Earle S. Arnold of West Hartford, Conn., president; Donald R. Mackay of St. Paul, vice-president, and Wayne L. McCulley of Cleveland, Tenn., secretary.

JOURNALISM CONFERENCE

A modernization program for dental journals will be presented by a publications designer, Dan Smith of Chicago, at the joint meeting of the American Association of Dental Editors and the Coun-

cil on Journalism, to be held September 26 at the Hotel Hollenden.

Mr. Smith will advise editors on the layout, illustrations, typography and general design of their journals.

A business meeting of the A.A.D.E. will convene at 9:00 A.M. with Loren B. Taber of San Francisco presiding. The morning session also will include two presentations: "The Historical Significance of Dental Publications" by George B. Denton, chief manuscript editor of THE JOURNAL, and "Writing for the Reader, the Listener, the Viewer" by Warren Guthrie, head of the English and Speech Departments of Western Reserve University.

The afternoon session will feature, in addition to Mr. Smith's program, papers on "Solvency and How to Obtain It," by James Robinson, executive secretary of the Southern California State Dental Association, and "Writing Interest into Science" by Donald Dunham, science editor of the *Cleveland Press*.

SCIENTIFIC SESSION

A paper on "Public Dental Care in Norway" will be presented by Knut Gard of Oslo to the section on public health dentistry Monday afternoon, September 8. The ten other scientific sections also will present featured essayists Monday and Wednesday afternoons. The mornings of Tuesday, Wednesday and Thursday have been reserved for combined sections, featuring panel discussions by outstanding authorities on dentifrices, anesthetics and denture service.

A total of 160 table clinics, 46 scientific exhibits and 200 technical exhibits will also be presented.

Scientific Exhibits • An experimental "mouth" simulating *in vivo* conditions will be shown by the U. S. Navy as one of the scientific exhibits at the 94th annual session. The metal and plastic enclosed "mouth", which permits breathing, salivary rinsing and pulpal circulation, affords a method of artificially producing calculus and dental caries.

This exhibit and 45 others will be housed in the exhibition hall of the Cleveland Auditorium and may be viewed Monday through Thursday from 9 A.M. to 5 P.M. Exhibitors include dental schools, federal organizations and individuals.

Motion Picture Program • Four full days of scheduled dental films will be presented at the motion picture theater in the Cleveland Public Auditorium. The

The newest exhibit of the American Dental Association is designed primarily for use with lay audiences, especially in communities that are conducting a program for fluoridation of their water supplies. The exhibit is available through the Order Department on a free loan basis, with the borrower paying only return shipping charges. Shipping weight is approximately 350 pounds; height, 7 feet; width, 8 feet. Transparencies to the right and left are lighted in sequence and tell the basic story of fluoridation in concise form. Send requests to Order Department, American Dental Association, 222 East Superior Street, Chicago 11.

programs will be offered Monday through Thursday from 9:30 A.M. to 5 P.M., with a recess period from noon to 1 P.M.

Of the 31 films scheduled, 29 which were produced in 1952-53 will have premier showings. The films treat topics such as technics for obtaining occlusion, implant dentures, intravenous anesthesia, and specialty subjects.

All silent films will be narrated by the men who produced them, and a discussion period will follow each film.

Program chairmen of dental societies, faculty committees and hospital staffs who wish to view films and to request specific ones for future programs may do so.

Technical Exhibition • Technical exhibits in the Cleveland Public Auditorium will open at noon Sunday, September 27, it has been announced by John J. Hollister, business manager of the Association.

"The earlier opening will provide an extra half day for visitors, particularly those attending preliminary meetings, to view the exhibition," Mr. Hollister announced. The opening was originally scheduled for Monday morning, September 28. Closing of the exhibit is scheduled for 5:00 P.M. Thursday, October 1.

HOTEL ACCOMMODATIONS

Few hotel accommodations are now available in Cleveland, it is reported by W. J. Pryor, chairman of the local arrangements committee.

Persons who cannot use accommodations already reserved for them are strongly urged to cancel their reservations with the Association's Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio. The hotel rooms will then be assigned to other applicants. Remaining accommodations will be allocated only to persons who use the official housing application blank on page A-19 of this issue of THE JOURNAL.

BOOKLET OUTLINES PROGRAM OF DENTAL HEALTH EDUCATION

A new pamphlet, *The Role of the Dental Society in the School Dental Health Education Program,* has been issued by the Division of Dental Health Education of the Association. Prepared as a guide for state and local dental societies, the booklet suggests ways in which the societies can function to improve the general dental health and the dental health education of school children.

Copies of the 12-page booklet have been distributed to state society officers, and state departments of health and education, according to Perry J. Sandell, director of the Division of Dental Health Education. Limited numbers of copies will be sent on request.

ASSOCIATION ENDORSES REED-JENKINS-KEOGH BILL

Association testimony filed August 7 with the House Ways and Means Committee endorsed the Reed-Jenkins-Keogh proposal to defer income taxes on funds invested in retirement programs by self-employed persons.

The testimony was filed by Paul E. Jones of Farmville, N. C., a member of the Council on Legislation, during the Committee's hearings on H.R. 10.

Dr. Jones's testimony pointed out the difficulty encountered under the present tax structure by professional men who wish to provide pensions for themselves.

"Because of our system of graduated taxation which takes a progressively greater share of one's income as it increases, the dentist finds it difficult to take advantage of his few more prosperous years to initiate a sound and intelligent retirement program," Dr. Jones stated.

The Reed-Jenkins-Keogh proposal would defer income tax liability on a limited amount of funds set aside each year by the self-employed person for his own pension.

COUNCILS DECRY CLAIMS FOR ANTIENZYME DENTIFRICE

The Council on Dental Research and the Council on Dental Therapeutics have registered the dental profession's strong objection to the claims of the Lambert Company (Jersey City, N. J.) that its new dentifrice, Listerine Antizyme, will assure consumers immunity to dental decay.

The Councils have pointed out that the claims—widely disseminated in the past two weeks by advertising and publicity—are not supported by clinical data, although they are based on antienzyme studies in progress at Northwestern University Dental School.

In a statement issued in mid-August, the Councils advised the public and the dental profession to adopt a conservative attitude toward the new product and criticized as "contrary to the public interest" suggestions that the use of the antienzyme dentifrice could be substituted for well-recognized dental health procedures.

The full text of the Councils' statement is printed on page 349 of this issue of THE JOURNAL.

Antizyme was introduced commercially on August 20, coincident with the publication of a scientific report on antienzyme laboratory research published by Leonard S. Fosdick of the Northwestern University Dental School in the *Journal of Dental Research*.

Dr. Fosdick reported that laboratory investigations supported by the Lambert Company and Colgate-Palmolive-Peet indicate that two chemicals inhibit enzymes in their acid-forming action. The use of these chemicals in dentifrices is now being tested clinically by several thousands of people; however, the first of two such studies will not be completed until late spring, Dr. Fosdick has said.

Wall Street Journal reports that the following dentifrice manufacturers also are preparing to place antienzyme dentifrices on the market: Colgate, the Block Drug Company (Ammident), Bristol-Myers (Ipana) and American Home Products (Kolynos).

(See editorial comment, page 354.)

Dental Societies

TENNESSEE DENTAL SOCIETY ELECTS EXECUTIVE SECRETARY

The new executive secretary of the Tennessee State Dental Association is John H. Shumaker, a graduate of Vanderbilt University and former newspaper reporter. Mr. Shumaker was elected at a special meeting of the constituent society's executive council August 2, announces Wayne L. McCulley, secretary-treasurer. Mrs. Nola B. Christopher will continue as assistant to the secretary in the state association's central office, 902 Bennie Dillon Building, Nashville 3.

GREATER NEW YORK MEETING SCHEDULED FOR DECEMBER

The annual Greater New York Dental meeting is scheduled for December 8-12 at the Hotel Statler according to Mabel Purdy, executive secretary. Officers this year consist of Arthur E. Corby, general chairman; Stanley G. Standard, advisory chairman; Joseph L. Riesner, vice-chairman; and Jacob Feinman, secretary-treasurer. Sponsors of the meeting are the First and Second District Dental Societies of New York State, Room 106A, Hotel Statler, New York 1, N. Y.

National Defense

LEGION OF MERIT AWARDED TO NAVY DENTAL OFFICER

The Legion of Merit with Combat "V" was presented August 4 to Cmdr. William E. Ludwick, DC, USN, head of the Dental Branches of the Research Division and the Biological Sciences Division, Office of Naval Research.

Commander Ludwick received the award for service in Korea during November 1951-August 1952. His citation reads in part: "For exceptionally meritorious conduct in the performance of outstanding services to the Government of the United States while serving as senior dental officer of the First Marine Aircraft Wing in connection with operations against enemy aggressor forces in Korea . . ."

A graduate of the University of Nebraska College of Dentistry, Commander Ludwick has been in the Navy Dental Corps since 1941. He formerly was associated with his father in the practice of dentistry in Lincoln, Neb. He is a member of the Lincoln District Dental Society, Nebraska State Dental Society, the American Dental Association, American Association for the Advancement of Science and the American College of Dentists.

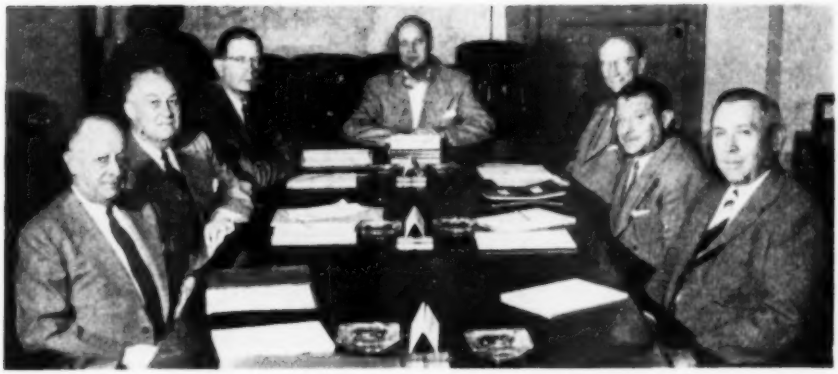
AMALGAM PLUS INGENUITY RESTORES RADAR SET

An imaginative dentist recently repaired a critically needed radar set at the Keflavik Airport, Iceland, and enabled its crew to maintain operations after mechanics had predicted a 60 day blackout of the screen.

After the radar set had burned out, its maintenance crew discovered that it would be impossible to fix it with materials on hand. It would take two months for the necessary parts to arrive from the United States.

However, Lt. Jerome H. Perry, assigned as a dentist with the 1400th Med-

A dental clinic was opened July 21 at the Bitburg Air Base, Germany, by the United States Air Forces in Europe. Participating in the opening ceremony were (l. to r.) Brig. Gen. Marvin E. Kennebeck, assistant for dental service, Office of the Surgeon General; Col. Donald B. Lenkerd, command dental surgeon of the Twelfth Air Force; Maj. Jerome G. Spielberger, dental surgeon of the Bitburg Air Base; Col. I. Louis Hoffman, Base surgeon; 1st Lts. P. J. Strollo and A. Tarlow, assistant dental surgeons of the Base; Maj. Gen. Dan C. Ogle, surgeon, USAFE, and Col. Walter J. Reuter, dental surgeon, USAFE



James P. Hollers of San Antonio (extreme right), dental member of the Civilian Health and Medical Advisory Council of the Department of Defense, is shown with other Council members at a recent meeting with Melvin A. Casberg (center), assistant to the Secretary of Defense (Health and Medical). From left are: William S. Middleton, Anthony J. J. Rourke, Dwight L. Wilbur, Dr. Casberg, Alfred R. Shands, Jr., Isidor S. Ravdin and Dr. Hollers. The three to the right were members of the Armed Forces Medical Policy Council, which recently was dissolved when the new Council was formed.

ical Squadron, Iceland Defense Force, learned of the situation and offered his aid. By relining the burned portion of the set with silver amalgam, he put it back into working condition within a few hours.

Information on Lieutenant Perry's technic has been sent to the Pentagon and will be distributed to other bases for use if ever a similar situation arises. Meanwhile, the 1952 graduate of Columbia University's dental school has been made an honorary member of the maintenance crew.

ARMY, NAVY TO RELEASE 525 DENTAL OFFICERS

Approximately 250 Naval Reserve dental officers on active duty and 275 Army dental officers will be eligible for release by September 27 under the provisions of the new draft act, Public Law 84, it has been announced.

Officers eligible for release within 90 days of the June 29 enactment of the law are Priority II registrants or Reserves with 17 or more months of previous service or those whose prior and current service terms meet the required totals defined in the "sliding scale" provisions of the law.

AIR FORCE TO EMPLOY CIVILIAN DENTAL HYGIENISTS

Civilian dental hygienists are needed by the Air Force for assignment to dental offices at various bases.

An applicant must be registered as dental or oral hygienist in the District of Columbia or a state or territory of the United States, and

(a) must show successful completion of a 12 months' course from a recognized school of dental hygiene and one full year of technical experience as a dental or oral hygienist; or

(b) two full years of technical experience as a dental or oral hygienist.

The designation of the position is "Dental Hygienist, GS-4" and the salary is $3,175.

Inquiries must be addressed to Employment Office, Attention: EWACER, Wright-Patterson Air Force Base, Ohio.

Dental Education

L. E. VAN KIRK RESIGNS AS PITTSBURGH DENTAL DEAN

Lawrence E. Van Kirk has resigned as dean of the University of Pittsburgh School of Dentistry because of continued ill health, the University announced August 18.

William F. Swanson, associate dean and professor of histology and bacteriology, has been appointed acting dean, the announcement revealed. Dr. Van Kirk, a graduate of the School in 1919, has been dean since August 1947; at that time Dr. Swanson, a graduate of the School in 1920, was appointed associate dean.

FULBRIGHT AWARDS OFFERED FOR RESEARCH, TEACHING

The announcement of Fulbright awards for university lecturing and advanced research in Europe and the Near East, Japan and Pakistan is now available and may be obtained from the Committee on International Exchange of Persons, 2101 Constitution Avenue, N.W., Washington 25, D. C.

Closing date for making application for dental teaching or research awards is October 15.

HAWAII UNIVERSITY CONTINUES DENTAL HYGIENE PROGRAM

The continuance of the dental hygiene program at the University of Hawaii was assured recently when the Hawaiian legislature appropriated the necessary funds to carry on the program for the next biennium, reports Samuel W. Glynn of Honolulu. The threatened closing of the program was opposed by the Hawaii Territorial Dental Society.

Miss Hazel Tanji will be the new director of the program, replacing Mrs. Agnes C. Bickerton, head of the department for the last 30 years, who retired recently. Miss Tanji just completed graduate work at Columbia University as the first student in the University's new graduate program for hygienists.

DENTAL INTERNS, RESIDENTS ADVISED TO GET VISITOR VISA

Foreign dentists planning to take internships or residencies in the United States have been advised to obtain exchange-visitor visas before entering this country, in order to avoid the necessity of registering as immigrants for military training or service.

Exchange-visitor visas are issued only to persons participating in programs approved as exchange programs by the Department of State; therefore, American hospital boards also have been advised to apply for designation as sponsors of exchange-visitor programs if they plan to select foreign interns or residents.

Persons who enter the United States with immigrant visas and who depart without serving in the Armed Forces may render themselves inadmissible into the United States as persons who departed to evade service in the Armed Forces.

Also, if such a person fails to report for induction after being called by a Selective Service board, he may be subject to prosecution by federal authorities.

UNIVERSITY OF IOWA BEGINS DENTAL HYGIENIST TRAINING

A two-year program to train dental hygienists is being instituted this month by the College of Dentistry of the State University of Iowa, under the direction of W. J. Simon, dean of the College.

Women students who complete the two-year program will be qualified for

licensing examination to become dental hygienists as provided under Iowa law, University officers announced.

The program was recommended by the University Relations Committee of the Iowa State Dental Society in consultation with members of the College faculty. Committee members were: Harry G. Bolks of Sioux City, chairman; Glenn C. Anderson of Avoca; Alvin W. Bryan, dean emeritus of the College; George S. Easton of the faculty; Floyd W. Pillars of Des Moines; Philip T. Williams of Anita and Henry M. Willits of Dubuque.

Enrollment in the program has been limited to 28, with preference given to Iowa residents. The minimum requirement for admission is graduation from an accredited high school.

Courses in the program include specialized chemistry, nutrition, psychology, anatomy, microbiology, hygiene, physiology, pathology and pharmacology. Students will also study communication skills, social studies, economics and office management, dental hygiene and dental health education.

MEDICAL CENTER ANNIVERSARY TO BE OBSERVED IN OCTOBER

A dental exhibit, a symposium on "Pain in Dental and Oral Surgery" and a cocktail party for dental alumni of Columbia University will be features of the October 12-13 scientific and social program in observance of the twenty-fifth anniversary of Columbia-Presbyterian Medical Center, New York.

The symposium is to be presented on the afternoon of October 12. Participants include Ruth Moulton, Carl R. Oman, Emanuel M. Papper, John E. Scarff, Joseph Schroff, L. Laszlo Schwartz, Lewis R. Stowe, Daniel P. Tausig and Jules G. Waltner.

L. Laszlo Schwartz of New York is chairman of the dental and oral surgery subcommittee; members of the subcommittee are Joseph De Lisi, Manuel Maslansky, Boaz Shattan, Albin R. Seidel and H. L. Malter.

DENTAL SCHOOLS ANNOUNCE NEW POSTGRADUATE COURSES

California • A general review course in dentistry will be offered November 30-February 1 by the University Extension of the University of California, Los Angeles.

Subjects to be covered in didactic lectures are prosthetics, orthodontics, physiology, histology, pathology, operative dentistry, anesthetics and oral surgery, chemistry, metallurgy and dental materials, materia medica and therapeutics, anatomy, biochemistry, pedodontics, oral diagnosis and roentgenology. The course will also include laboratory technics and clinical procedures with patients.

Information may be obtained from J. Eugene Ziegler, head of the dental program at the University Extension, 813 South Hill Street, Los Angeles 14.

A new addition to the Baylor University College of Dentistry is now under construction. Shown at the extreme right (darkened wing), it is a new $600,000 wing to accommodate the basic science departments, dental research, school of dental hygiene, museum and administrative offices. When completed in the fall of 1954, the addition will enable Baylor to increase its dental school enrollment by one third, reports Dean Harry B. McCarthy.

New York • A total of 18 postgraduate courses will begin during September and October at the New York University College of Dentistry. Ranging in duration from one week of daily sessions to eight months of weekly sessions, the courses will include precision attachment, physiology, complete denture prosthesis, inhalation anesthesia, operative dentistry and crown and bridge.

Other courses will be pedodontics, research in physiology, public health, periodontics, pathology, airbrasive, anatomy, oral surgery and roentgenology.

Further information may be obtained from Miss Catherine Iozzo, secretary of the postgraduate division, New York University College of Dentistry, New York 10.

Oregon • Five postgraduate dental courses will be presented during the fall term at the University of Oregon Dental School. Dates, subjects and instructors of the courses are:

September 21-25, occlusal equilibration by Arne G. Lauritzen of Seattle; October 22-23, dentistry for children by Hugo Kulstad of Bakersfield, Calif.; October 26-27, practice management by Forrest R. Slavens of Steamboat Springs, Colo.; November 2-6, crown and bridge by Alver Selberg of San Francisco; November 16-20, oral surgery by Samuel A. Brandon of Portland, Ore.

Detailed information on these courses may be obtained by writing to Ernest A. Hurley, acting head of the postgraduate department, University of Oregon Dental School, Portland 14, Ore.

Washington (Seattle) • Six postgraduate dental courses will be offered during the remainder of 1953 by the University of Washington School of Dentistry.

Courses include practical root canal therapy, September 8-12; hydrocolloid indirect technic—for inlays and bridges, October 3-5; application of high speeds and modern instruments to restorative procedures, October 26-27; theory and practice of periodontics, November 16-18; diagnosis and treatment planning in children's dentistry, November 20-21; practice administration, December 3-5.

Additional information may be obtained from the director, postgraduate dental education, School of Dentistry, University of Washington, Seattle 5.

International

F.D.I. URGES FLUORIDATION, RE-ELECTS OREN A. OLIVER

Oren A. Oliver of Nashville, Tenn., was re-elected to the presidency of the Fédération Dentaire Internationale at the organization's recent annual meeting in Oslo. LeRoy M. Ennis of Philadelphia and Philip Adams of Boston were elected vice-presidents, and Harold Hillenbrand of Chicago, secretary of the Association, was named an honorary vice-president.

A resolution urging "the promotion and use of fluorides in the control of dental caries" was passed unanimously by the delegates. The resolution "affirms that there has been no evidence of any deleterious effect to general health by the addition of fluorides in appropriate amounts to drinking water."

Of the 141 international leaders of the dental profession in attendance at the meeting, 21 were from the United States. Among the assignments to commission memberships were the following:

Scientific Commission: F. A. Arnold, Jr., of Washington, D.C.; M. K. Hine of Indianapolis and Lester Burket of Philadelphia;

Public Dental Service Commission: John Knutson of Washington, D.C. and R. W. McNulty of Los Angeles;

Dental Education Commission: Shailer Peterson of Chicago and W. N. Hodgkin of Warrenton, Va.;

Armed Forces Commission: Brig. Gen. Marvin Kennebeck, DC, USAF, and Rear Adm. Daniel Ryan, DC, USN, of Washington, D.C.

Philip Blackerby of Ann Arbor was elected representative of the F.D.I. in the Americas to act in liaison with the Secretary-General.

Dr. Ennis, who was chairman of the United States delegation, accepted appointments to the advisory committee on investment of funds, the committee on finance of the 1954 meeting and the editorial board of the *International Dental Journal*.

The next F. D. I. meeting will convene June 10, 1954, at The Hague, The Netherlands.

INTERNATIONAL GROUP ISSUES DENTAL STUDENTS' JOURNAL

Journal of the I.A.D.S., a new trilingual quarterly publication issued by the International Association of Dental Students, is now offered to students in the United States for subscription at $2.00 annually. Articles by international authorities, as well as by students, book reviews and announcements are printed in the English, French and German languages.

Subscription orders and inquiries may be addressed to the editor, Günther Kühn, Friedrichstrasse 10, Marburg—Lahn, West Germany.

RESEARCH DIRECTOR'S POST OPEN IN SOUTH AFRICA

The University of Witwatersrand in Johannesburg, South Africa, is accepting applications for the post of director of its new Dental Research Unit. The post carries with it the status of professor.

The Unit, to be located at the University Oral and Dental Hospital, has been established jointly by the University and the South African Council for Scientific and Industrial Research.

The director will organize and develop the newly-established Unit, conduct investigations of oral and dental conditions, train research workers and teach a limited number of postgraduate courses.

Information may be obtained by writing immediately, by air mail, to the Registrar, University of Witwatersrand, Milner Park, Johannesburg, South Africa.

Veterans Administration

VETERANS FROM 1898 RETAIN RIGHT TO VA DENTAL CARE

The recent Veterans Administration appropriations bill (P. L. 149) which limited the number of beneficiaries eligible for VA outpatient dental care will not affect the eligibility of Spanish-American War veterans to adjunct dental care, as their entitlement is based on previous laws.

This opinion has been issued by Edward E. Odom, solicitor of the Veterans Administration.

Thus, the VA apparently will approve hometown dental care as an adjunct to medical treatment for any of the 70,000 eligible Spanish-American War veterans.

The 1953-54 appropriations bill which Congress passed in July allocates 23-million dollars to hometown dental care with the proviso that applications for treatment must be made within a year of the enactment of the bill and that dental disabilities, to be treated, must be proved to have been present at the time of discharge. Dental disabilities occurring within a year after discharge are no longer presumed service connected.

Public Health

USPHS DENTAL BUDGET RESTORED TO $1,740,000

The sum of $1,740,000 has been appropriated for 1953-54 to the dental health activities of the U. S. Public Health Service, including the operation of the National Institute of Dental Research.

This figure was recommended by President Eisenhower and the Senate Committee on Appropriations. Previously, the House of Representatives had cut the appropriation by $90,000, but the Senate figure prevailed in a joint conference.

The total appropriation for the Department of Health, Education and Welfare amounts to $1,738,399,261 of which $71,000,000 is to be allocated to the seven National Institutes of Health and $65,000,000 to hospital construction grants.

PHYSICIAN NAMED ASSISTANT TO H. E. W. SECRETARY

A Boston physician, Chester Scott Keefer, has been appointed special assistant for health and medical affairs to the Secretary of Health, Education and Welfare.

A professor of medicine at Boston University School of Medicine, Dr. Keefer's previous governmental service has been as supervisor of penicillin and streptomycin distribution for the United States and allies in World War II and as chairman of the National Research Council's committee on chemotherapeutics which advised on civil defense medical stockpiling.

He has been physician-in-chief at Massachusetts Memorial Hospital since 1940 and has served as a member of the Council on Pharmacy and Chemistry of the American Medical Association. He will act as adviser to the Secretary of Health, Education and Welfare on health and medical programs of the Department and on health and medical legislation.

HARRY LYONS CHOSEN MEMBER OF USPHS ADVISORY COUNCIL

Harry Lyons of Richmond, Va., speaker of the Association's House of Delegates, has been appointed to a four-year term as a member of the USPHS National Advisory Dental Research Council, according to an announcement from Oveta Culp Hobby, Secretary of the Department of Health, Education and Welfare.

The Council meets three times a year in Washington for consultation with the Surgeon General of the U. S. Public Health Service on current dental pro-

Two clinicians who conducted a postgraduate dental seminar in eight Tennessee cities during July were awarded plaques July 30 by the Tennessee State Dental Association and the Tennessee Department of Public Health. Shown at the presentation are (l. to r.) Walter C. Sandusky, Jr., chairman of the Memphis sessions; Albert G. Richards of Ann Arbor, who spoke on dental roentgenology; John W. Geller of Indianapolis, who spoke on dental prosthetics, and Carl L. Sebelius, director of the Tennessee division of dental health.

grams of the Service. A major responsibility of the Council is to review and to judge applications for grants to nongovernmental research projects.

Another responsibility of the Council is the continuing survey of total research in dentistry and the recommendation of action necessary to stimulate additional work in gap areas. Members of the Council are lay and professional leaders in the fields of health, science, education and public affairs.

The next meeting of the National Advisory Dental Research Council will be held November 23, 1953.

NEW YORK STATE SEEKS DENTAL HYGIENISTS

The New York State Civil Service Commission is now accepting applications for dental hygienist positions in state hospitals and institutions. Starting salary is $3,251, and the maximum salary of $3,731 is reached after three annual pay increases. Candidates must be residents of New York State and eligible to practice as dental hygienists in New York.

Further information may be obtained by writing to the New York State Department of Civil Service, State Office Building, Albany 1, N. Y.

General

OASI COVERAGE FOR DENTISTS ASKED BY EISENHOWER

A proposal that dentists as a group be brought into the Social Security program was included in President Eisenhower's August 1 message to Congress.

The provision was embodied in a plan for extending Social Security (including Old Age and Survivors' Insurance) to persons not now covered. Formulated by an advisory committee of the Department of Health, Education and Welfare, the plan is advocated by Oveta Culp Hobby, Secretary of the Department.

Dentists would be included by compulsory coverage if the Social Security program is extended to "the group of about half a million self-employed professional persons with net incomes of $400 or more in a year." This includes physicians, dentists, lawyers, engineers, architects, accountants and funeral directors.

Secretary Hobby's plan would provide for the payment of full-rate OASI benefits within two or three years to newly covered persons "who are or will then be old enough for retirement."

A bill, H.R. 6812, which implements the plan has been submitted for consideration by the Committee on Ways and Means of the House of Representatives during the next session of Congress.

DENTAL EDITORS' ASSOCIATION ISSUES REVISED MANUAL

The second edition of *A Manual for Dental Editors,* prepared and published by the American Association of Dental Editors, is now available for purchase at $1.50 per copy, announces Loren B. Taber of San Francisco, president of the A.A.D.E.

The 48-page book, originally published in 1949, is designed to assist editors of the journals of constituent or component societies and specialty organizations; authors of scientific manuscripts, abstracts and book reviews; production managers and business managers.

The committee which revised the

Manual was composed of William P. Schoen, Jr., of Chicago, chairman; the late E. Frank Inskipp of San Francisco and Lon W. Morrey of Chicago.

Copies may be ordered from L. Franklin Bumgardner, 4-H Doctors Building, Charlotte 7, N. Y.

ACADEMY OF DENTAL MEDICINE TO DISCUSS GERIATRICS

Geriatrics will be the topic discussed by the American Academy of Dental Medicine at its midwinter luncheon and meeting December 6 at the Hotel Statler, New York.

The luncheon and round-table discussion on dental treatment of the aged will begin at 12:30 P.M. The event is open to all interested dentists and physicians, reports William M. Greenhut, secretary. Reservations may be obtained from Dr. Greenhut at 124 East 84th Street, New York 28.

NATIONAL ALUMNI BREAKFAST TO BE HELD AT CLEVELAND

Alumni of the Baltimore College of Dental Surgery, University of Maryland Dental School, will meet at their annual breakfast at 8:00 A.M., Tuesday, September 29, in the Cleveland Hotel.

All alumni who are in attendance at the 94th annual session of the American Dental Association are invited to the breakfast, it is announced by Joseph M. Tighe of Towson, Md., secretary of the National Alumni Association.

ALUMNI OF CHICAGO COLLEGE OF DENTAL SURGERY TO MEET

Alumni of the Chicago College of Dental Surgery, Loyola University, will meet at a breakfast reunion September 30 in Cleveland. The breakfast will be held at 7:30 A.M. in the Rose Room of the Cleveland Hotel and will be open to all alumni and guests, announces R. C. Van Dam of Chicago, president of the Alumni Association.

BILLION DOLLARS SPENT FOR DENTAL CARE IN 1950

Personal expenditures for dental care totaled $1,028,000,000 during 1950, it has been announced by the United States Department of Commerce. The Department's estimate does not include governmental or philanthropic expenditures. This is the first year in which expenditures for dental care topped the $1,000,000,000 mark, the Department noted.

A detailed report on the Department's survey will be issued by the Bureau of Economic Research and Statistics in the October issue of THE JOURNAL.

DENTIST, PHILANTHROPIST HENRY SPENADEL DIES

Henry Spenadel, eminent orthodontist and philanthropist of New York City, died June 9 at the age of 76.

Dr. Spenadel's long record of service to dentistry was acknowledged in 1949, when the Eastern Dental Society created the Henry Spenadel Award Fund to honor "distinguished and significant contributions to dentistry." The First District Dental Society of New York, which accepted trusteeship of the Fund, annually selects a worthy recipient of the Award.

In 1949 Dr. Spenadel contributed funds to the First District Dental Society to be used to further dental education; the fund is now known as the Henry Spenadel Fund for the Advancement of Education in Dentistry.

A native of Austria, Dr. Spenadel came to this country in his boyhood, earned his D.D.S. degree at the New York College of Dentistry in 1904 and practiced until his death 49 years later.

He was a member of the Board of Directors of the First District Dental Society of New York, past president of the

Eastern Dental Society and a fellow of the American College of Dentists. He also held memberships in the Dental Society of the State of New York, the American Dental Association, the Northeastern Society of Orthodontists, the New York Academy of Dentistry and Sigma Epsilon Delta. In his will Dr. Spenadel bequeathed to dental organizations and causes almost half a million dollars.

MOST PATIENTS SATISFIED, COUNTY HEALTH SURVEY FINDS

A recent survey of 500 residents of Mecklenburg County (Charlotte), N. C., disclosed that the vast majority of residents were satisfied with dental and medical service, but many were ignorant of the expenses encountered in practice and the charity work which professional men perform.

The main criticisms about dentists were "high fees" and "long waiting for appointments." However, only one out of every five persons expressed criticism of dentists.

Other findings of the survey were:
67 per cent of those persons questioned said they had a family dentist;
83 per cent said they had no trouble obtaining the services of dentists;
45 per cent thought there was no shortage of dentists (19 per cent gave no opinion);
66 per cent thought it proper to ask what the charges would be before engaging a dentist;
56 per cent thought that the charges dentists made were fair (13 per cent gave no opinion);
31 per cent tried to estimate what percentage of a dentist's full income must be paid out for expenses, and the average estimate was 11 per cent (instead of the actual 45 per cent);
20 per cent tried to estimate what percentage of a dentist's time was given to charity patients; the average estimate was 7 per cent.

Also . . . A general report of the Kellogg Foundation's 22 year program shows that a total of $2,767,000 has been spent for dental projects and activities by the Foundation since 1930 . . . Francis A. Arnold, Jr., director of the National Institute for Dental Research, has been elected to membership in the American Epidemiological Society and the Washington Academy of Medicine. . . . The new Veterans Administrator is Harvey V. Higley of Marinette, Wis., who succeeds Carl R. Gray, Jr. . . . Alaska Dental Society is the new name for the former Alaska Territorial Dental Society, announces Frank N. Dorsey of Anchorage, president. The new name was selected at the constituent organization's recent meeting in Juneau. . . . A survey by the American Dental Trade Association of 82 dental supply houses shows that the dealers' aggregate sales increased last year but that operating profits decreased slightly. Dealers who reported actual losses blamed high salaries and low gross profits. . . . The National Advisory Committee to the Selective Service System has announced the resignation of James C. Sargent, Milwaukee physician, and the appointment of Francis J. Braceland, psychiatrist of Hartford, Conn.

Book Reviews

JUVENILE DENTISTRY

By Walter C. McBride. Fifth edition. 370 pages with 302 illustrations. Index. Price $7. Philadelphia, Lee & Febiger, 1952.

This fifth edition of a well-known text is in reality a new book compiled from the best of the author's previous editions. It is a volume that will benefit both the student and the practitioner with its complete, practical and well-balanced coverage of all aspects of dentistry as applied to the child patient.

The discussion on management of various types of child patients is excellent and perhaps could even have been enlarged, since understanding of this phase of juvenile dentistry governs the success or failure of the dentist in this field. Although there is a good section on the neglected field of diet in relation to caries control in the child, the importance of this topic warrants a more complete coverage than it is given. On the other hand, the chapter on physical diagnosis by H. V. Dwyer, M. D., is the most thorough discussion to appear in any pedodontic text. Diagrams throughout the book are excellent, but possibly the author might have selected newer illustrations to clarify some of the involved technics.

Dr. McBride has succeeded in combining the basic, established principles of pedodontics with the latest advances and procedures evaluated in the light of present knowledge. His material is at all times clear, concise and very readable.

Robert J. Carroll

ORAL SURGERY

By Kurt H. Thoma. Second edition. 1,688 pages with 1,789 illustrations, 121 in color. Two volumes. Index Price $30. St. Louis, C. V. Mosby Co., 1952.

A great many oral surgeons are already familiar with Thoma's *Oral Surgery*, the first edition of which was published in 1948. Although the improvements of the new edition are not major, it would appear pertinent to list briefly the principal enlargements and additions which have been made:

1. A chapter on oral plastic procedures (not including cleft lip and cleft palate) is added.

2. Antibiotic therapy is given more space and a separate chapter.

3. A chapter dealing principally with bone grafts and splints for repair of acquired defects of the mandible is included.

4. Oral surgical-prosthodontic problems are treated more fully and placed in a separate chapter.

5. The material on general and local anesthesia has been increased and placed in a separate chapter.

A considerable improvement in the new edition is simply the improved arrangement of material with better grouping of subject matter for easy access.

To this reviewer's mind this is the best oral surgery text yet written. It is lucid and comprehensive, yet not smothered by detail. Its improvements over the 1948 edition are worthwhile. It is a text that will be very useful to all students of oral surgery.

James O'Brien

THE STORY OF DENTAL CARIES

By R. W. Bunting. First edition. 94 pages with no illustrations. Price $2.50. Ann Arbor, The Overbeck Company, 1953.

As the title indicates, the author relates the quest for the solution and control of tooth decay based on his forty years of personal experience in this perplexing field. The text is not a scientific treatise; it contains no bibliography; rather it is a narrative told with the same charm with which Dr. Bunting has captivated many audiences as he verbally told the story of dental caries.

The author reviews some of the early theories concerning caries etiology, the manner in which Willoughby D. Miller became interested in dental caries and the contributions he made toward its solution.

The research activity of others including G. V. Black, Sims Wallace, Pickerill, Leon Williams and many others is sketched. The controversy about diet, nutrition and caries is briefly considered, followed by a discussion of the importance of the tooth environment. The development of the Michigan Dental Caries Research Group and its accomplishments are outlined, and the story concludes with a brief but hopeful discussion on caries control.

A number of interesting anecdotes are told, including a dream about a visit with Leon Williams interrupted by George Wood Clapp

just as Williams was about to reveal an important message from W. D. Miller. Who knows—that frustrating interruption may have postponed the solution to the problem of caries.

There is considerable information and entertainment condensed into 94 pages; and although some may object to the superficial treatment given to this important subject, the intent of the writer has been to omit details which would obscure principles. The student and the layman alike, by reading this book, can obtain a rapid résumé of the effort that has been expended toward finding the solution to tooth decay.

Robert G. Kesel

THE CHEMICAL ELEMENTS

Edited by Helen Miles Davis. 160 pages. Price $2. Washington, D. C., Science Service Inc., 1952.

This book is an outline of the 98 chemical elements of the universe as predicated in the periodic table. The blank spaces most of us knew in our college chemistry days are now filled. The newest elements include those discoveries which came about as a result of the development of our atomic age. The last of the 98 elements was discovered in February 1950, but there is a prediction that a few more elements will be added.

The book tells briefly of the discovery of the elements, using condensed versions and excerpts from the original reports. The individual elements are discussed in groups, such as the alkali metals and alkaline earths. In some instances many years transpired before all the members of the group became known. Thus the discoveries of the elements of the transactinium earths began in 1789 with the description of uranium and were completed in February 1950 with the man-made californium.

The discussions and summaries in this volume provide data of interest to anyone working with chemical elements.

Dorothea F. Radusch

BOOKS RECEIVED BUT NOT REVIEWED

TREATMENT OF MENTAL DISORDER • By Leo Alexander, M.D. 507 pages. 143 illustrations. $10. W. B. Saunders Co., West Washington Square, Philadelphia, 1953.

PUTTING PR INTO HPER • By Joint Handbook Committee of the American Association for Health, Physical Education and Recreation and National School Public Relations Association. 65 pages. $1. American Association for Health, Physical Education and Recreation and National School Public Relations Association, 1201 16th St., N.W., Washington, D.C., March 1953.

SURVEY OF ANTIMALARIAL AGENTS: CHEMOTHERAPY OF PLASMODIUM GALLINACEUM INFECTIONS; TOXICITY; CORRELATION OF STRUCTURE AND ACTION • By G. Robert Coatney, Ph.D.; W. Clark Cooper, M.D.; Nathan B. Eddy, M.D., and Joseph Greenberg, Ph.D. 323 pages. 135 tables. $1.25 (paper). Superintendent of Documents, U. S. Government Printing Office, Washington, D.C., 1952.

ORGANIZATION AND OPERATION OF CIVIL DEFENSE CASUALTY SERVICE—PART I—THE FIRST AID SYSTEM • Federal Civil Defense Administration. 52 pages. 18 illustrations. 20c. U. S. Government Printing Office, Washington, D.C., January 1953.

THE RADIANT UNIVERSE • By George W. Hill. 489 pages. 10 illustrations. $4.75. The Philosophical Library, Inc., 15 E. 40th St., New York, 1952.

CLINICAL ENDOCRINOLOGY, VOLUMES I AND II. • By Lewis M. Hurxthal, M.D., and Natalija Musulin, B.S., M.D. 1,599 pages. 482 illustrations, 146 charts, 1 color plate. $24. J. B. Lippincott Co., East Washington Square, Philadelphia, 1953.

THE PSYCHOLOGY AND PSYCHOTHERAPY OF OTTO RANK: AN HISTORICAL AND COMPARATIVE INTRODUCTION • By Fay B. Karpf, Ph.D. 129 pages. Illustrations. $3. Philosophical Library, Inc., 15 E. 40th St., New York, 1953.

THE HISTORY OF THE RHODE ISLAND STATE DENTAL SOCIETY—DIAMOND JUBILEE CELEBRATION, PROVIDENCE, RHODE ISLAND • 54 pages. Illustrations. Rhode Island State Dental Society, 1467 Westminster St., Providence, 1953.

ATOMS, MEN AND GOD • By Paul E. Sabine. 226 pages. $3.75. Philosophical Library, Inc., 15 E. 40th St., New York, 1953.

HOSPITAL FORMULARY AND COMPENDIUM OF USEFUL INFORMATION • University of California. Second edition. 318 pages. $3.75. University of California Press, Berkeley, Calif., 1952.

Current Literature

OBSERVATIONS CONCERNING THE HISTOGENESIS OF THE EPITHELIAL ATTACHMENT

Louis J. Baume. J. Periodont 23:71 April 1952.

The histogenesis of the epithelial attachment and the formation of a gingival sulcus were studied in the successional and accessional tooth groups of 20 rhesus macaques at consecutive pre-eruptive and posteruptive stages.

After the enamel was formed, the outer elements of the enamel organ were reduced into a syncytium of uniform prickle cells. The prickle cells were connected with the ameloblasts by intercellular bridges containing prominent tonofibrils. Near the surface of the enamel these tonofibrils were seen to fuse together and to form a continuous membrane, the primary cuticle, which eventually calcified. The epithelial attachment and sulcus formation during tooth eruption were based on the following histogenic processes: (1) involution of the enamel organ, (2) desmolysis of the connective tissue between the oral and enamel epithelium and (3) fusion of the oral and enamel epithelium.

Variation in the timing of these events, apparently related to the stresses exerted by the horizontal and vertical movements of the erupting tooth, was as follows:

1. At the sites of eruptive pressure the ameloblasts atrophied while prickle cells proliferated interstitially, replacing the ameloblasts prior to clinical tooth eruption. As the lamina propria became dissolved, oral epithelium proliferated toward the reduced enamel epithelium, fused with it and grew along its basal layer. After the tip of the crown had emerged, the reduced enamel epithelium underwent progressive atrophy from the marginal points of increased thickness of oral epithelium until the sulcus was established.

2. In the absence of pressure, prickle cells proliferated with their basal layer in the presence of intact ameloblasts. After eruption of the tooth, the ameloblasts formed the primary attachment. The oral epithelium did not fuse continuously with the enamel epithelium but proliferated at first some distance behind it and later followed the pattern described in Point 1.

Studies with the phase-contrast microscope show that even though the two epitheliums fuse, the enamel epithelium never changes into stratified squamous epithelium by metaplasia. A process of replacement is the uniform pattern. There was evidence that a normal physiologic desmolysis precedes proliferation of the oral epithelium toward the connective tissue side. Study of the enzymatic aspect of this process should offer some new possibilities in the control of excessive downgrowth of the epithelial attachment in pathologic pocket formation and periodontal atrophy.

Sumter S. Arnim

TREATMENT OF SUPPURATIVE PERIODONTAL LESIONS

John Oppie McCall and Bernard Herzog. New York D.J. 18:457 Nov. 1952.

Elimination of the periodontal pocket, required for success in eradicating infection and checking the inflammatory process, can be accomplished by one of several methods even when the disease is rather far advanced.

Preliminary procedures, including correction of occlusion, are to be carried out together with any general health measures required. Elimination of pockets requires either removal of overlying gingival tissue or, preferably, the securing of its reattachment to the root surface. The fact that reattachment is attainable in a large number of cases has been demonstrated by animal experimentation and by histological examination of human cases which have undergone treatment.

Methods of treatment may be classified as follows:

1. Conservative: curettage without incision of the gingiva, with or without the use of a caustic drug.

2. Conservative—surgical: curettage after the flap is turned back, repositioned and sutured.

3. Surgical—with partial gingivectomy: similar to method no. 2 but with excision of that part of soft tissue unlikely to form a reattachment.

4. Gingivectomy: complete removal of soft tissue pocket wall (used when prognosis for reattachment by methods no. 1, 2 or 3 is poor).

Method no. 1 has given success in a high percentage of cases and is the method of choice except in advanced cases. A requisite for success is thorough curettage of the inner soft tissue wall after root surface curettage.

Soft tissue curettage may be facilitated by application of one of several caustic or scarifying drugs. The object of curettage is to remove severely damaged basement tissues and epithelium lining the pocket. It is unnecessary to remove all granulomatous tissue, as formation of this tissue is nature's response to injury and its development is a step in tissue repair.

Anesthesia is needed. For a shallow pocket it may be sufficient to insert a slender twist of cotton saturated with tetracaine hydrochloride (2 per cent) and to leave it in place for two minutes. For more advanced lesions procaine hydrochloride infiltration or block anesthesia is required.

Exposed molar bifurcations and trifurcations are treated by filling with zinc oxide-eugenol cement injected after curettage as previously mentioned. This cement can be replaced readily if distintegration occurs. The method makes it possible to save otherwise hopeless molars.

TEACHING HUMAN RELATIONS IN DENTAL PUBLIC HEALTH WORK

William G. Hollister. Am. J. Pub. Health 43:3 March 1953.

In the practice of dentistry the field of human relations has been neglected. Something can be done to counteract both the individual's fear of dental operations and his indifference to dental health which prevent many persons from obtaining needed dental care.

Surveys have been made which substantiate the need for dentists to develop psychological knowledge and verbal skills to change these attitudes. In the attainment of these objectives the mental health professional men can make important contributions to the practice of dentistry.

The surveys already mentioned demonstrate clearly the indifference of the average dentist to his need for acquiring an understanding of human relations and the skills to work with difficult patients to diminish fear of dental procedures.

Frank C. Cady

THE EFFECT OF THYROID HORMONE ON DENTAL AND PARADENTAL STRUCTURES

Louis J. Baume and Hermann Becks Paradentologie 6:89 Oct. 1952.

A review of the experimental approach to thyroid physiology provides a background for a study of the effect of the thyroid hormone on dental and periodontal structures.

The teeth and the supporting bone of a group of rats thyroidectomized at birth and killed at 63 days of age and of a control group which received thyroxin injections for 31 days were analyzed roentgenographically and histologically. From an evaluation of the data on the basis of previous reports by Evans and others concerning the experimental changes in somatic appearance, pituitary histology and skeletal structures of the same animals, the following conclusions seemed to be suggested:

1. The general function of the thyroid in controlling cell metabolism was manifested by the stunted growth (25 per cent) and the decreased eruption rate of the incisors (45 per cent) together with the retardation of molar eruption in the thyroidectomized animals.

2. The connective tissue of the lamina propria, periodontal membrane, periosteum, bone marrow and pulp of the thyroidectomized animals showed reduced amount of cellular and vascular elements and prominent fibrous components.

3. The formative elements of cartilage, bone cementum and dentin in the thyroprival state maintained a depressed activity leading to the obliteration of the marrow spaces and a narrowing of the periodontal and pulpal lumens.

4. While cessation of cartilage erosion and modeling resorption were responsible for the arrest of skeletal maturation, depressed vascularization contributed to the delay in tooth eruption.

5. Epithelial tissues, such as oral epithelium, epithelial attachment, hair follicles, salivary glands and odontogenic epitheliums, remained virtually aplastic in the thyroprival condition; proliferation was diminished, histodifferentiation greatly delayed and the life cycle considerably shortened. These defects were conducive to such hypothyroid symptoms as scaly skin and oral mucosa, diminished sweating and salivation and defective integument. Retarded and malposed tooth eruption was the consequence of dysplastic changes in the cervical loop. Degeneration of the epithelial attachment was due to precocious atrophy of the reduced enamel epithelium.

6. Thyroxin substitution therapy eliminated the thyroprival conditions only partially because of the polydynamic effects of thyroidectomy, especially the hypophysial syndrome and the interrelationship with vitamin A and the parathormone.

7. Normal thyroid function proved to be a systemic factor of utmost importance for the proper development of a well-formed dentition for the maintenance of healthy periodontal structures and particularly for the health of the epithelial attachment.

Sumter S. Arnim

Deaths

Arink, William J., St. Louis, Ohio College of Dental Surgery, University of Cincinnati, 1902; died April 21; aged 72.

Bakke, Frederick C., Warren, Minn.; College of Dentistry, University of Minnesota, 1909; died May 1; aged 68.

Barnes, Willis F., Pittsburgh; School of Dentistry, University of Pittsburgh, 1925; died May 6; aged 50.

Barry, Leicester K., Etna, Pa.; School of Dentistry, University of Pittsburgh, 1927; died April 21; aged 48.

Barteau, Sid B., Chicago; Dental School, Northwestern University, 1920; died March 10.

Barton, Ira G., La Monte, Mo.; died May 3; aged 77.

Belding, Paul H., Waucoma, Iowa; College of Dentistry, University of Iowa, 1919; died June 3; aged 57.

Berwick, Edward C., Austin, Texas; School of Dentistry, Vanderbilt University, 1904; died May 27; aged 72.

Black, John A., Paterson, N. J.; Baltimore College of Dental Surgery, University of Maryland, 1912; died April 22.

Blaesser, George W., Manitowoc, Wis.; Dental Department, Milwaukee Medical College, 1905; died April 14; aged 69.

Bliss, C. Lee, Detroit; College of Dental Surgery, University of Michigan, 1907; died May 4; aged 72.

Braddock, Alfred A., Portland, Ind.; Indiana Dental College, 1899; died May 9.

Brothers, Richard M., Cincinnati; died May 11; aged 54.

Bumgardner, Ward L., Columbus, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1902; died May 13; aged 81.

Campbell, Oliver R., Philadelphia; Philadelphia Dental College, 1919; died April 16; aged 57.

Carroll, James F., New Milford, Conn.; died May 16; aged 66.

Cathcart, James A., Chicago; Baltimore College of Dental Surgery, University of Maryland, 1905; died May 10; aged 84.

Chandler, Charles F., Montgomery, Ala.; Baltimore College of Dental Surgery, University of Maryland, 1896; died April 21; aged 77.

Chinappi, Pasquale J., Camden, N. J.; School of Dentistry, Temple University, 1932; died May 20; aged 47.

Cloyd, John M., Oneida, Ill.; Indiana Dental College, 1905; died March 14; aged 73.

Coupland, J. C., Van Wert, Ohio; School of Dentistry, Western Reserve University, 1915; died April 19.

Cragin, Harold I., Camden, N. J.; Pennsylvania College of Dental Surgery, Philadelphia, 1900; died May 18; aged 73.

Danforth, James S., Sheboygan, Wis.; Dental Department, Milwaukee Medical College, 1899; died in June.

Dice, Roy E., Pittsburgh; School of Dentistry, University of Pittsburgh, 1913; died May 1; aged 62.

Dodin, Edward J., New Rochelle, N. Y.; New York College of Dentistry, 1906; died May 4; aged 77.

Gai, Hector G. Risegari, Boston; Dental School, Tufts College, 1906; died April 22; aged 69.

Gallagher, Patrick J., Jessup, Pa.; School of Dentistry, University of Pennsylvania, 1908; died April 23; aged 76.

Gentilly, James V., Cleveland; School of Dentistry, Western Reserve University, 1914; died June 1; aged 64.

Gilfillan, Lee A., Bangor, Wis.; Dental Department, Milwaukee Medical College, 1898; died April 19; aged 78.

Gobeille, George A., Springfield, Mass.; Faculty of Dental Surgery, University of Montreal, 1921; died May 5; aged 59.

Greiper, Louis P., New York; College of Dentistry, New York University, 1928; died May 9; aged 48.

Grennan, Robert E., Bennington, Vt.; Pennsylvania College of Dental Surgery, Philadelphia, 1899; died May 14; aged 76.

Griswold, George N., Auburn, N. Y.; Pennsylvania College of Dental Surgery, Philadelphia, 1889; died May 1; aged 83.

Grove, Norman C., Chambersburg, Pa.; Chicago College of Dental Surgery, Loyola University, 1900; died April 25; aged 76.

Grzebik, Joseph J., Bayonne, N. J.; School of Dentistry, Georgetown University, 1933; died April 24; aged 45.

Harvey, John P., Metamora, Ill.; Chicago College of Dental Surgery, Loyola University, 1895; died April 28; aged 82.

Havely, Charles K., Tulsa, Okla.; died May 4; aged 73.

Hayes, Cecil A., Detroit; Chicago College of Dental Surgery, Loyola University, 1923; died April 18; aged 68.

Heerwald, Edgar W., Tulsa, Okla.; Chicago College of Dental Surgery, Loyola University, 1915; died April 29; aged 63.

Directory

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Fourth Annual Session	Sept. 28-Oct. 1, 1954	Cleveland
Ninety-Fifth Annual Session	Nov. 8-11, 1954	Miami
Ninety-Sixth Annual Session	Oct. 17-20, 1955	San Francisco

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 25-27, 1954	Biloxi, Miss.	F. A. Finney, Jr.	1045 Forrest Ave., Gadsden
Alaska	June 20, 1954	Mt. McKinley National Park	C. J. Pearson	500 K St., Anchorage
Arizona	Apr. 21-24, 1954	Phoenix	E. M. Scott	17 E. Weldon Ave., Phoenix
Arkansas	Apr. 1954	Little Rock	D. M. Hamm	Box 89, Clarksville
California	Apr. 26-28, 1954	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	May 3-5, 1954	Los Angeles	J. P. Bowers	903 Crenshaw Blvd., Los Angeles
Colorado	Oct. 4-7	Colorado Springs	W. R. Humphrey	724 Republic Bldg., Denver
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 13, 1954	Wilmington	J. C. Baker	Mayfair Apts., Sec. C., 1300 Harrison St., Wilmington
District of Columbia	Mar. 14-17, 1954	Washington	Z. B. Lloyd	2007 R St., N.W., Washington
Florida	Apr. 25-28, 1954	Daytona Beach	B. S. Carroll	706 Professional Bldg., Jacksonville
Georgia	Oct. 18-21	Atlanta	J. W. Yarbrough	Bibb Bldg., Macon
Hawaii			J. H. Dawe	810 N. Vineyard St., Honolulu 17
Idaho			C. G. Hanson	409 11th Ave., S., Nampa
Illinois			P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 17-19, 1954	Indianapolis	E. E. Ewbank	Box 96, Kingman
Iowa	May 3-5, 1954	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 16-19, 1954	Wichita	F. A. Richmond	861 Brotherhood Bldg., Kansas City
Kentucky	Apr. 5-7, 1954	Louisville	A. B. Coxwell, Jr.	1976 Douglass Blvd., Louisville
Louisiana	Apr. 21-24, 1954	Baton Rouge	J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June 28-30, 1954	Rockland	S. M. Gower	Box 27, Skowhegan
Maryland	May 3-5, 1954	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore
Massachusetts	May 2-5, 1954	Boston	H. E. Tingley	12 Bay State Road, Boston
Michigan	Apr. 25-28, 1954	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 22-24, 1954	St. Paul	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 5-8, 1954	Biloxi	B. A. Cohen	306 Plaza Bldg., Jackson
Missouri	June 13-16, 1954	St. Louis	E. D. Suggett	201 Merchants Bank Bldg., Jefferson City
Montana	May 6-8, 1954	Great Falls	E. G. Vedova	Roundup
Nebraska		Omaha	F. A. Pierson	1112 Federal Securities Bldg., Lincoln
Nevada	June 1954	Reno	O. M. Seifert	506 Humbolt St., Reno
New Hampshire	June 13-15, 1954	Whitefield	F. E. Williams	814 Elm St., Manchester
New Jersey	May 4-6, 1954	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 23-26, 1954	Santa Fe	I. S. Eilar	Medical Arts Square, Albuquerque
New York	May 10-12, 1954	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 16-19, 1954	Pinehurst	R. D. Coffey	Kibler Bldg., Morganton
North Dakota	May 23-25, 1954	Bismarck	V. B. Keltgen	517 de Lendrecie Bldg., Fargo
Ohio	Nov. 8-11	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 25-28, 1954	Oklahoma City	D. Robertson	434 N.W. 13th St., Oklahoma City
Oregon	Mar. 1-3, 1954	Portland	W. H. Hurley	308 Selling Bldg., Portland
Panama Canal Zone	Dec. 8	Balboa	C. F. Atkins	DC, USA, Box 115, Rodman
Pennsylvania			M. D. Zimmerman	217 State St., Harrisburg

State	Date	Place	Secretary	Address
Puerto Rico			F. Ordoñez	1558 Ponce de León Ave., Stop 23, Santurce
Rhode Island	Jan. 17, 19, 20, 1954	Providence	N. G. Migliaccio	1467 Westminster St., Providence
South Carolina		Columbia	J. R. Owings	7 Medical Court, Greenville
South Dakota	May 20-22, 1954	Sioux Falls	E. W. Elmen	Sioux Falls
Tennessee	May 10-12, 1954	Chattanooga	W. L. McCulley	Brown Bldg., Cleveland
Texas	Apr. 25-29, 1954	Dallas	W. Ogle	3607 Gaston Ave., Dallas
Utah	Apr. 8-10, 1954	Salt Lake City	K. L. Dedekind	914 Medical Arts Bldg., Salt Lake City
Vermont	May 16-18, 1954	Woodstock	W. J. Reardon	18 Madison St., Rutland
Virginia	Apr. 12-14, 1954	Richmond	W. T. McAfee	705 Colonial National Bank Bldg., Roanoke
Washington	Mar. 25-27, 1954	Seattle	W. B. Martin	Medical-Dental Bldg., Seattle
West Virginia		White Sulphur Springs	G. N. Casto, Jr.	710½ Lee St., Charleston
Wisconsin	Apr. 20-22, 1954	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 20-24, 1954	Rock Springs	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama			N. E. Allen	Du Bose Bldg., Selma
Alaska			P. H. Williams	Box 2122, Juneau
Arizona			R. K. Trueblood	107 East A Ave., Glendale
Arkansas			H. O. Weatherly	205 Halter Bldg., Conway
California			K. L. Nesbitt	507 Polk St., San Francisco 2
Colorado			C. K. Phillips	724 Republic Bldg., Denver 2
Connecticut	Nov. 5	Bridgeport	C. G. Brooks	302 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. T. Birthright	1835 Eye St., N.W., Washington 6
Florida	July 12-22, 1954*†	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			S. H. Yarbrough	12 Medical Arts Bldg., Columbus
Hawaii	Sept. 1, 5, 6*†	Honolulu	H. L. Houvener	427 Dillingham Bldg., Honolulu
Idaho			R. E. Blickenstaff	1023 Fourth St., S., Nampa
Illinois	Oct. 26-29	Chicago	W. A. McKee	503 Wood Bldg., Benton
Indiana	Nov. 16-19*†	Indianapolis	C. A. Frech	504 Broadway, Gary
Iowa	May 24-28, 1954*†	Iowa City	D. J. FitzGerald	615 Brick & Tile Bldg., Mason City
Kansas	Jan. 18-21, 1954*†		G. L. Teall	Box 71, Hiawatha
Kentucky			R. I. Todd	Western Union Bldg., Richmond
Louisiana			R. C. Steib	833 Maison Blanche Bldg., New Orleans
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland	Nov. 3-4	Baltimore	H. Levin	3429 Park Heights Ave., Baltimore 15
Massachusetts			R. A. Barrette	Rm. 33, State House, Boston
Michigan	Jan. 24-30, 1954 June 6-12, 1954	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota			F. A. Larson	1632 Washington St., N.E., Minneapolis
Mississippi	Jan. 4-6, 1954 June 15-17, 1954	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
Missouri			R. R. Rhoades	414 Central Trust Bldg., Jefferson City
Montana			V. J. Quinn	301 Phoenix Bldg., Butte
Nebraska			H. E. Weber	1210 Federal Securities Bldg., Lincoln
Nevada			R. Whitehead	Suite 6, Masonic Temple, Reno
New Hampshire			D. J. Freese	4 Wall St., Concord
New Jersey	Nov. 30, Dec. 1*† Dec. 2-4*	Philadelphia Trenton	W. A. Wilson	150 E. State St., Trenton 8
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Oct. 6, 7†‡ Oct. 6-9*‡ Oct. 12†‡ Oct. 13, 15*†		D. W. Beier	23 S. Pearl St., Albany 7
North Carolina			E. O. Allred	1109 Liberty Life Bldg., Charlotte 2
North Dakota			A. B. Crabtree	Ellendale
Ohio	Oct. 26-30	Columbus	H. B. Smith	336 E. State St., Columbus
Oklahoma			R. P. Keidel	403 Surety Bldg., Muskogee

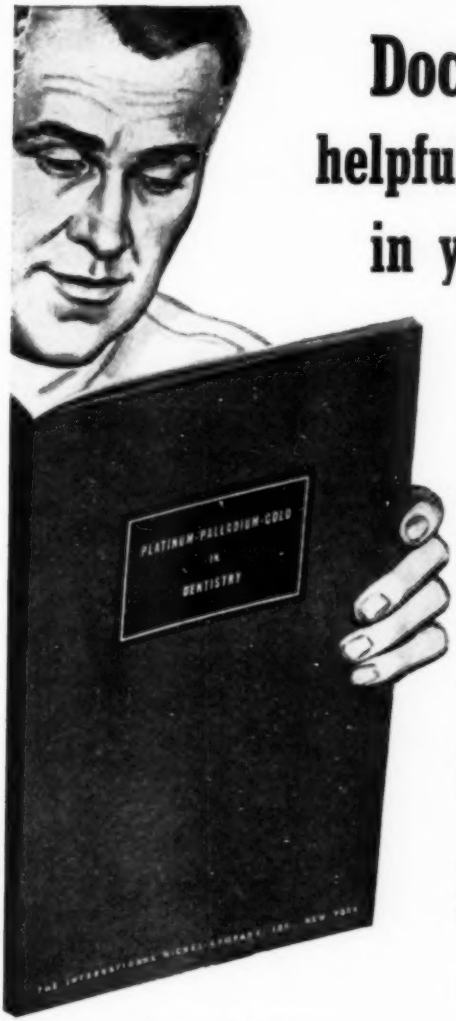
State	Date	Place	Secretary	Address
Oregon	Dec. 7-10	Portland	E. L. Utter	806 Pioneer Trust Bldg., Salem
Pennsylvania			A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg
Puerto Rico	Sept. 5	San Juan	I. Mercado C.	Box 4717, Santurce
Rhode Island	Nov. 24, 25	Providence	F. M. Hackett	267 Academy Ave., Providence
South Carolina			F. C. Sparks	1315 Pickens St., Columbia
South Dakota			H. T. Aker	Canton
Tennessee	Dec. 14§	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas	Oct. 25-30* Oct. 29, 30†	Houston	R. T. Weber	312 Capital National Bank Bldg., Austin
Utah			E. O. Thompson	915 Medical Arts Bldg., Salt Lake City
Vermont			F. A. Reid	Windsor
Virginia			J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington			T. D. Schimke	662 Paulsen Medical and Dental Bldg., Spokane
West Virginia			C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin	Jan. 11-15, 1954*†	Milwaukee	S. F. Donovan	Tomah
Wyoming			W. A. Hocker	212 O & S Bldg., Casper

*Dental examination.
†Dental hygiene examination.
‡Write to secretary of dental examining board for information on locations of examinations.
§Approximate dates—verify with state dental examining board.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
American Academy of Dental Medicine	Dec. 6	New York	W. M. Greenhut Secy.	124 E. 84th St., New York
American Academy of Gold Foil Operators	Sept. 26	Cleveland	G. D. Stibbs Secy.	School of Dentistry, University of Washington, Seattle 5, Washington
American Academy of Implant Dentures	Sept. 27	Cleveland	P. S. Loechler Secy.	Dental Corps, Camp Gordon, Ga.
American Association of Dental Editors	Sept. 26	Cleveland	L. F. Bumgardner Secy.	4-H Doctors Bldg., Charlotte 7, N. C.
American Association of Dental Examiners	Sept. 25, 26	Cleveland	C. A. Bumstead Secy.	924 Stuart Bldg., Lincoln, Neb.
American Board of Dental Public Health	Sept. 24, 25	Cleveland	P. E. Blackerby, Jr. Secy.	250 Champion St., Battle Creek, Mich.
American Board of Oral Pathology	Sept. 27	Cleveland	P. E. Boyle Secy.	University of Pennsylvania, 4001 Spruce St., Philadelphia
American Board of Oral Surgery	Oct. 17-21	Houston	L. M. FitzGerald Secy.	718 Roshek Bldg., Dubuque, Iowa
American College of Dentists	Sept. 27	Cleveland	O. W. Brandhorst Secy.	4952 Maryland Ave., St. Louis
American Dental Assistants Association	Sept. 28-Oct. 1	Cleveland	M. L. Martin Exec. Secy.	410 First National Bank Bldg., LaPorte, Ind.
American Denture Society	Sept. 25, 26	Cleveland	A. L. Roberts Secy.	Aurora National Bank Bldg., Aurora, Ill.
American Society of Dentistry for Children	Sept. 25-27	Cleveland	C. F. Tuma Chm. Local Arrangements	13201 Miles Ave., Cleveland
Association of American Women Dentists	Sept. 27, 28	Cleveland	F. Rich Secy.	6508 Delmar Ave., St. Louis 5
Canadian Dental Association	Oct. 18-21	Montreal, Canada	D. W. Gullett Secy.	234 St. George St., Toronto, Ontario, Canada
Chicago Dental Society	Feb. 7-10, 1954	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave., Chicago
Council on Dental Education, Dental Aptitude Tests	Oct. 30, 31		S. Peterson Secy.	222 E. Superior St., Chicago 11
Dallas Mid-Winter Dental Clinic	Jan. 24-27, 1954	Dallas	W. C. McCaskill, Jr. Chm.	1329 Medical Arts Bldg., Dallas, Texas
Denver Dental Association, Midwinter Meeting	Jan. 10-13, 1954	Denver	H. L. Harris Secy.	724 Republic Bldg., Denver

Name	Date	Place	Secy. or Chm.	Address
Detroit District Dental Society	Nov. 23, 24	Detroit	O. J. Fusilier Chm.	4421 Woodward Ave., Detroit
Great Lakes Society of Orthodontists	Nov. 2-4	Grand Rapids, Mich.	C. R. Anderson Secy.	402 Loraine Bldg., Grand Rapids, Mich.
Greater New York Dental Meeting	Dec. 7-11	New York	M. Purdy Exec. Secy	Hotel Statler, Room 106A, New York
Greater Philadelphia Annual Meeting	Feb. 8-5, 1954	Philadelphia	R. Adams Secy.	137 Bellevue-Stratford Hotel, Broad and Walnut Sts., Philadelphia
Greater Pittsburgh Dental Meeting	Dec. 1-3	Pittsburgh	W. E. Craig Secy.	206 Jenkins Bldg., Pittsburgh
Italian Congress of Stomatology, Twenty-eighth Congress	Oct. 13-17	Bari, Italy	P. D. Laforgia Gen. Secy.	Palazzo Ateneo, Bari, Italy
Journées Dentaires de Paris	Nov. 24-29	Paris, France	R. Rollard Secy.-Gen.	15, Boulevard Malesherbes, Paris, France
Mexican Dental Association, Second International Dental Congress	Nov. 15-21	Mexico City, Mexico	R. M. Ruiz Foreign Secy.	Asociacion Dental Mexicana, Insurgentes 257, Mexico City, Mexico
Mid-Continent Dental Congress	Nov. 16-18	St. Louis	J. E. Brophy Exec. Secy.	8015 Maryland Ave., St. Louis
National Board of Dental Examiners	Dec. 7, 8		G. J. Casey Secy.	222 E. Superior St., Chicago 11
New England Dental Society	Oct. 21, 22	Boston	F. L. Finley, Jr. Secy.	43 Farmington Ave., Hartford, Conn.
New Orleans Dental Conference	Nov. 8-11	New Orleans	R. W. Irvine P. R. Chm.	1203 Maison Blanche Bldg., New Orleans
Southern Society of Orthodontists	Nov. 1-4	Orlando, Fla.	M. D. Edwards Secy.	132 Adams Ave., Montgomery, Ala.
Southwestern Society of Orthodontists	Nov. 1-4	Little Rock, Ark.	F. Boyd Secy.	1502 N. Third, Abilene, Texas
Stomatological Society of Greece, First Panhellenic Congress	Oct. 25-30	Athens, Greece	B. Stefanopoulos-Vrettos Pres.	71, Skoufa St., Athens, Greece
Thomas P. Hinman Mid-Winter Clinic	Mar. 21-24, 1954	Atlanta, Ga.	S. Holbrook Exec. Secy.	15 Peachtree Place, N.W., Atlanta, Ga.



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Key No.	Hotel	Single	Double
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2	Allerton	4.50– 7.00	6.50– 10.00
3	Auditorium	4.50– 8.00	7.00– 11.00
4	Belmont	3.25– 4.25	5.75– 7.50*
5	Bolton Square	3.50– 5.00	6.50– 8.00
6	Carter	4.50– 8.00	7.00– 12.50
7	Cleveland	5.00– 10.00	8.50– 15.00
8	Commodore	6.50– 10.00	8.50– 12.00
9	Fenway Hall	6.00– 6.50	8.50– 10.00
10	Hollenden	4.50– 8.00	7.00– 16.00
11	Lake Shore	5.00– 8.00	9.00– up
12	New Amsterdam	3.00– 4.00	5.50– 7.00
13	Olmsted	$4.25– $8.00	$7.00–$10.00
14	Park Lane Villa	5.50– 6.00	7.00– 8.00*
15	Quad Hall	3.00– 6.00	6.00– 10.00
16	St. Regis	3.50– 5.00	5.00– 9.00
17	Sovereign	5.00– 7.00	7.00– 9.00
18	Statler	5.50– 9.50	8.50– 16.00
19	Stockbridge	4.00– up	6.00– up *
20	Tudor Arms	5.00– up	8.00– 11.00
21	Wade Park Manor	6.00– 7.00	9.00– 11.00
22	Westlake	6.00	8.00– 9.00

*Suites not available
Rates for suites available on request

Hotel reservation application

94th Annual Session
American Dental Association
Sept. 28—Oct. 1, 1953
Cleveland, Ohio

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Be sure to indicate your arrival time in Cleveland. Reservations will be held only until 6 p.m. of the day you indicate when you will arrive in Cleveland. Failure to notify the hotel of any last minute change in your arrival time may result in cancellation of the reservation.

Names of all persons who intend to occupy the accommodations must be listed on the application.

List four choices of hotels. Confirmation will be sent to the applicant indicating which hotel has accepted the reservation.

Write the A.D.A. Housing Bureau in Cleveland if you wish to cancel the reservation.

A.D.A. Housing Bureau • 511 Terminal Tower, Cleveland 13, Ohio

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_____
(Street address) (City) (Zone) (State)

Arrival in Cleveland _____ a.m. p.m. Leaving _____

Accommodations:

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(First choice) (Third choice)

Hotel _____ Hotel _____
(Second choice) (Fourth choice)

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☐ Double occupancy, double bed, rate to range from $ _____ to $ _____ per day. } 2 names must be listed below

☐ Double occupancy, twin beds, rate to range from $ _____ to $ _____ per day. }

☐ Suite of _____ rooms, including parlor, rate to range from $ _____ to $ _____ per day.

Occupants: (use an extra page for listing additional names if necessary)

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(Name) (Address) (City) (State)

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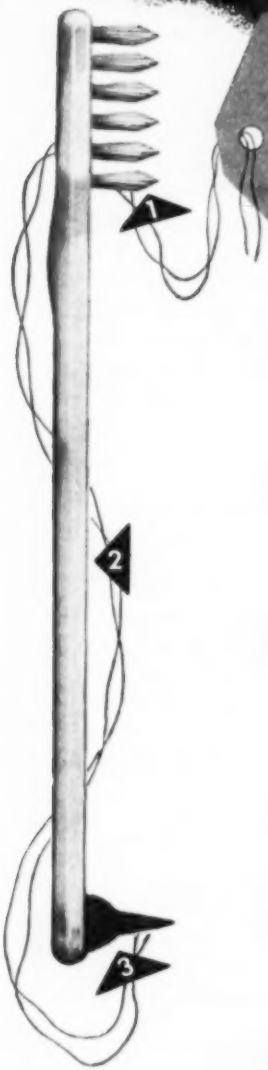

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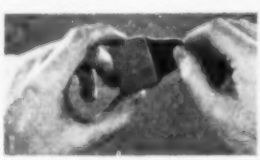

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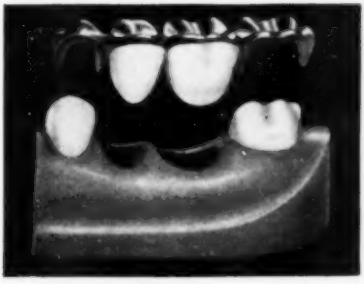

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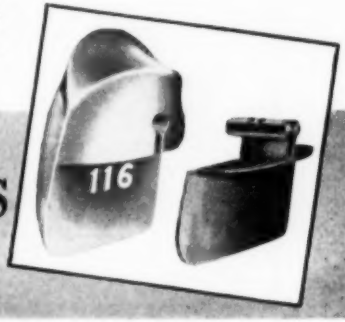

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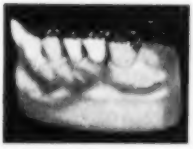

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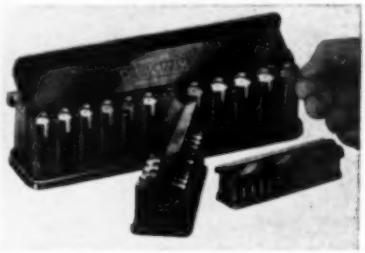

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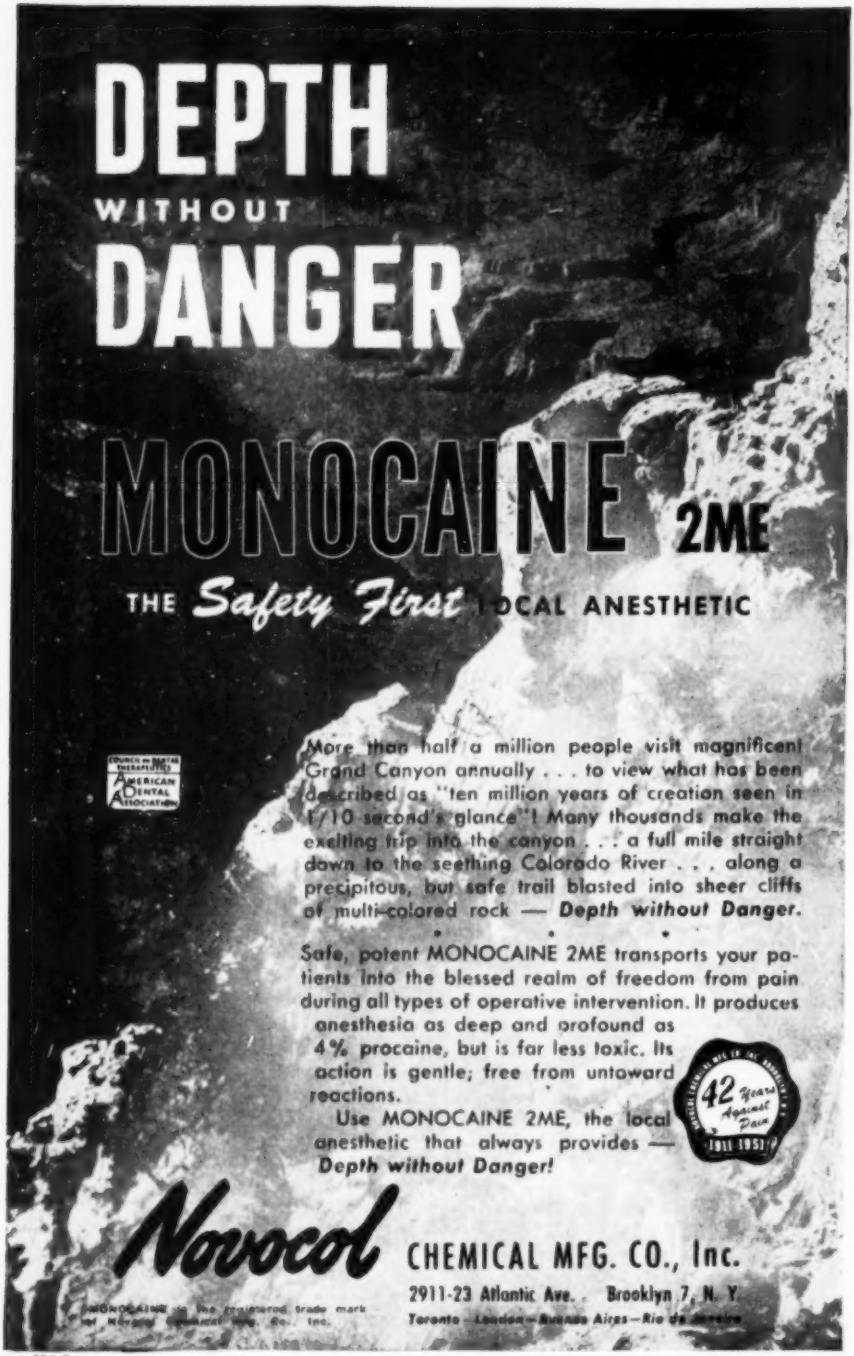
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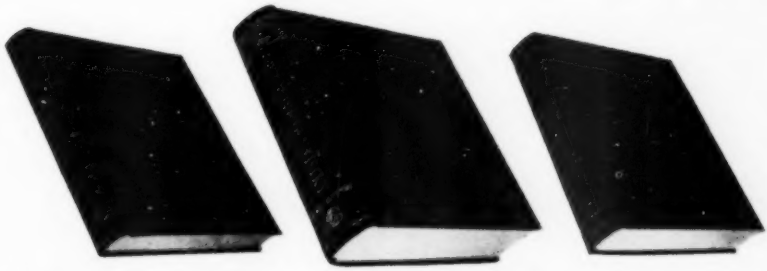

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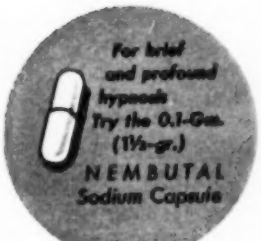

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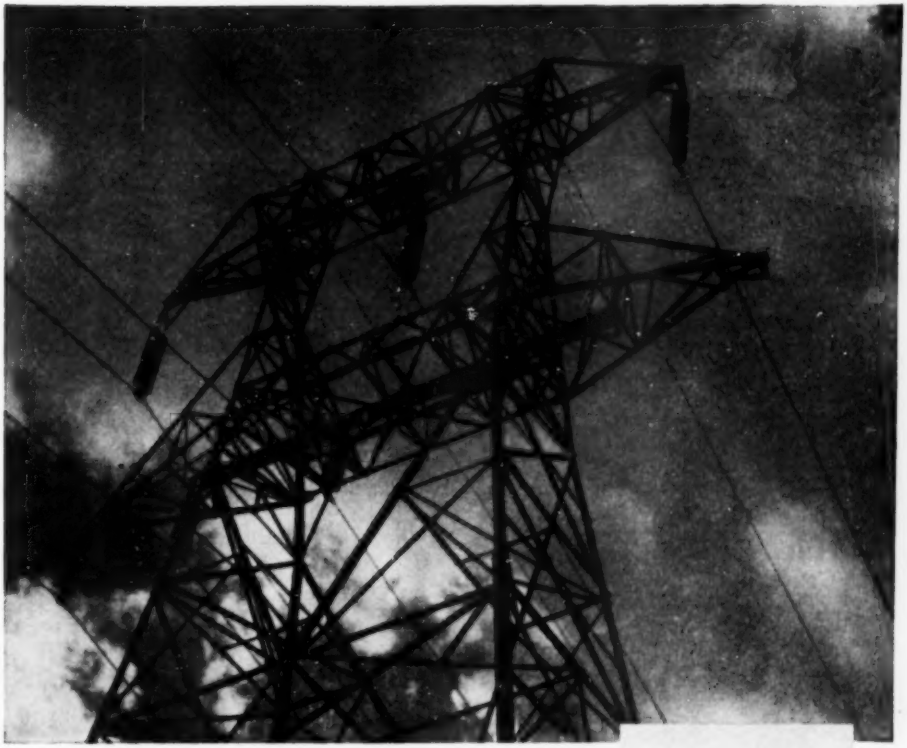

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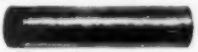

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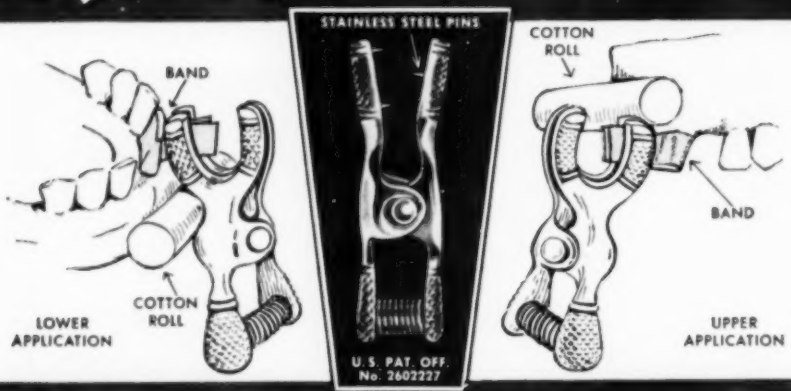

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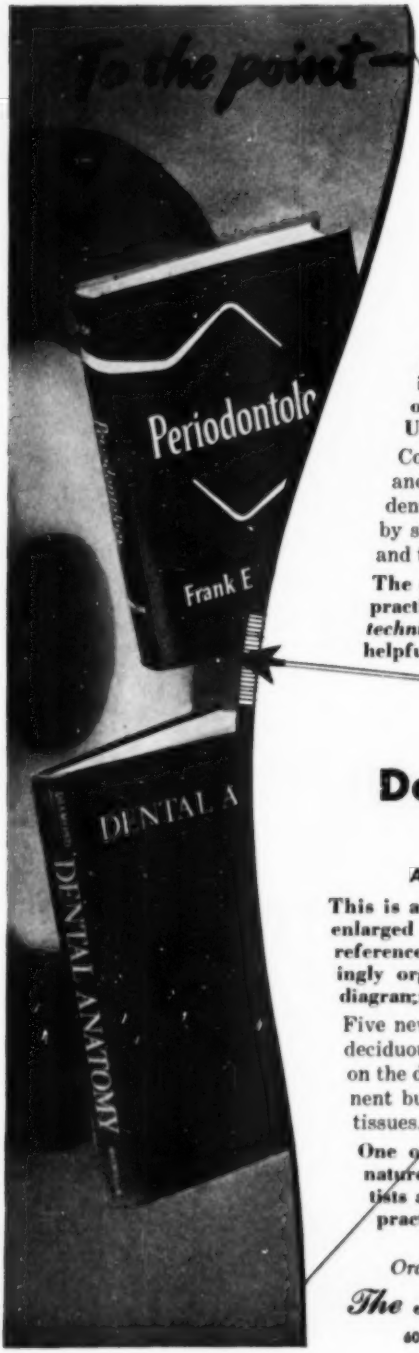

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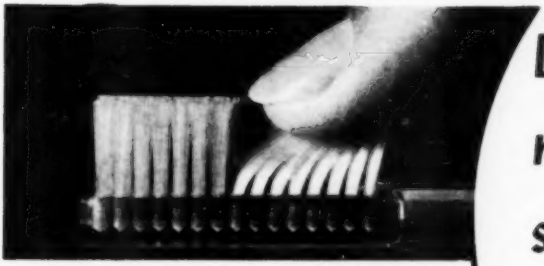

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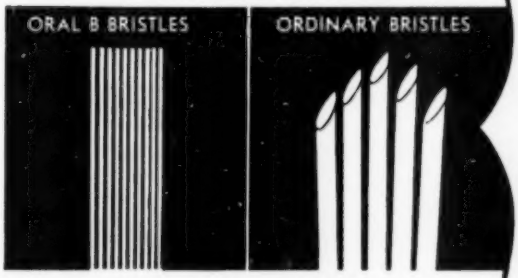

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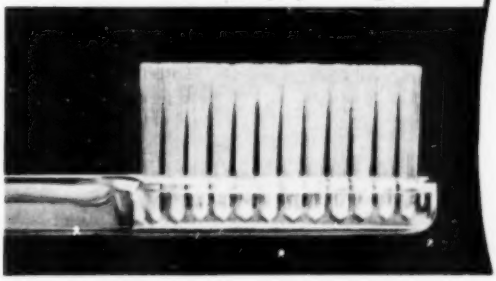

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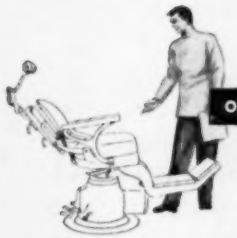

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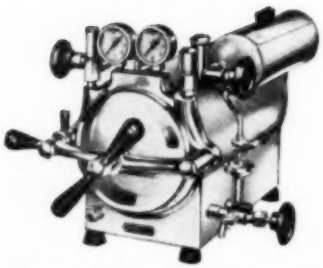

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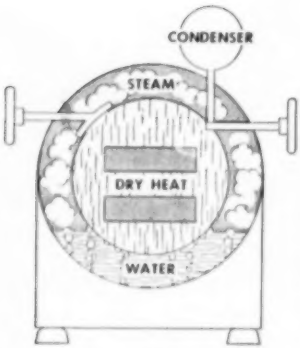

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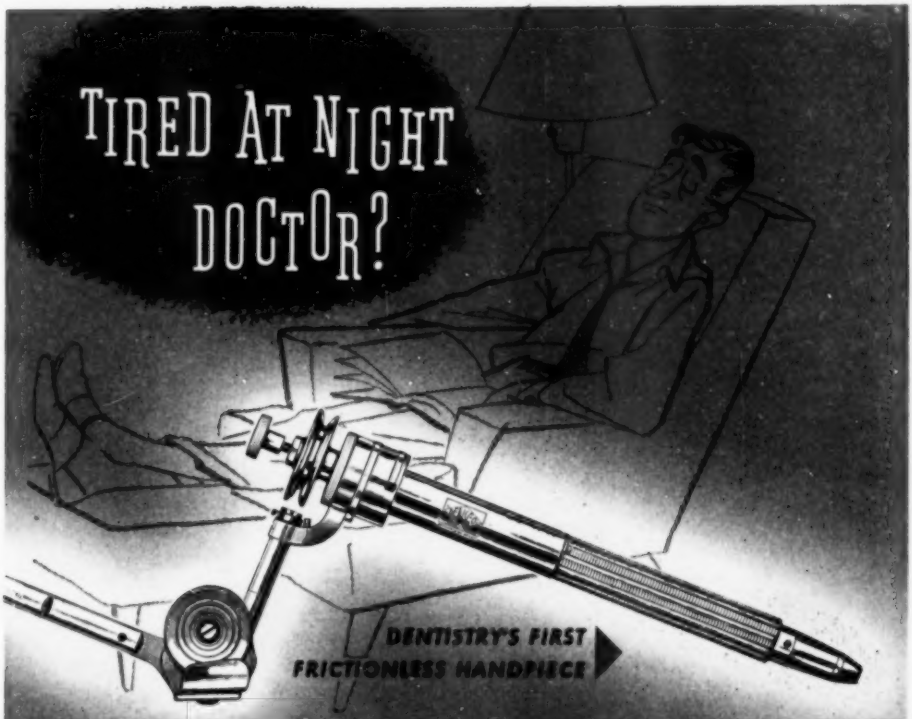

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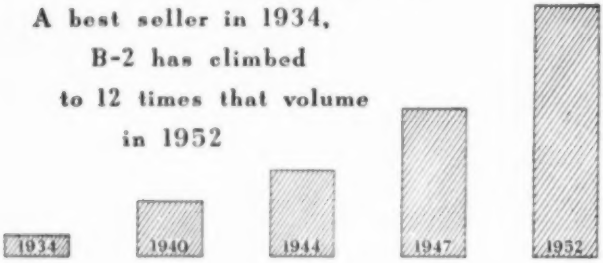

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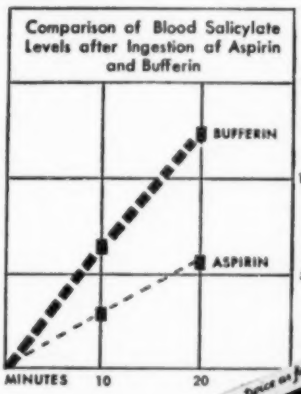

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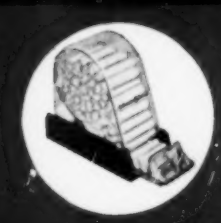

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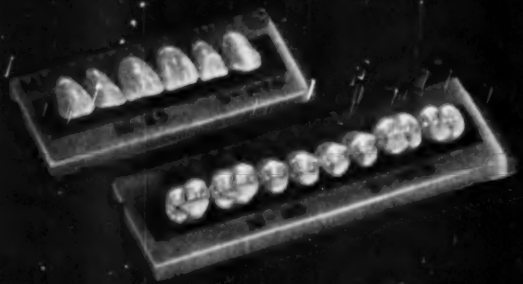

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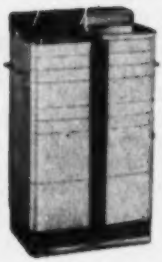

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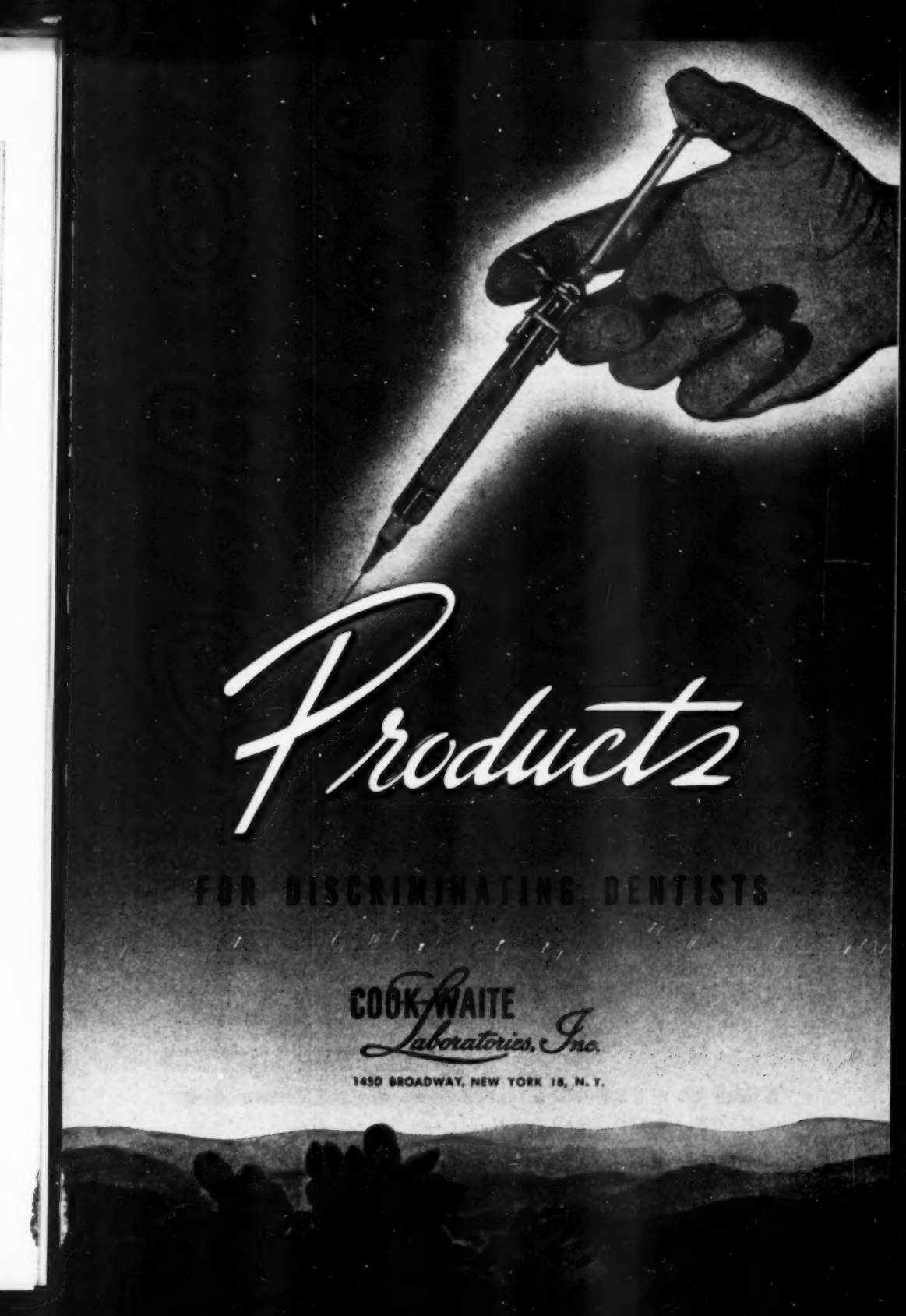
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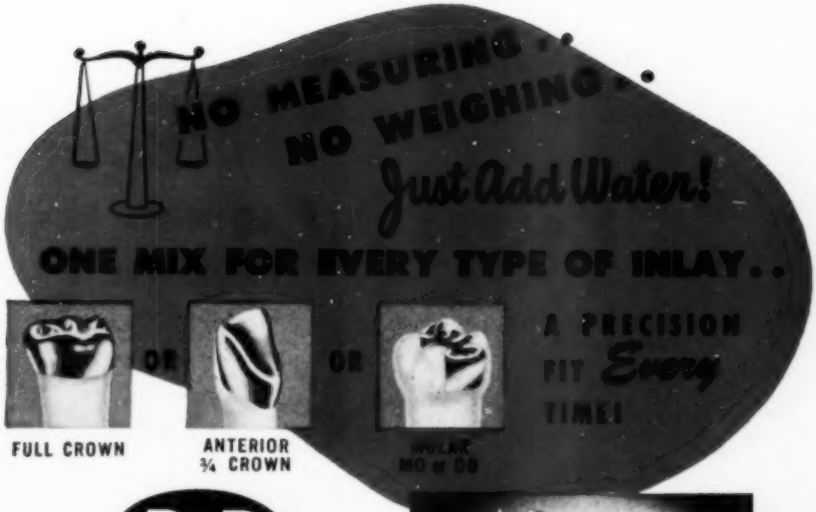

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1. Keefer, C. S., Postgrad. Med. 9:101, Feb. 1951
2. Flippin, H. F., and Israel, H. L., Med. Clin. North Amer. 34:1653, Nov. 1950

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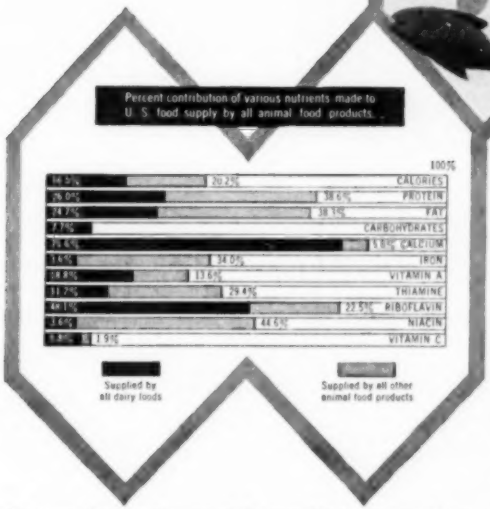

FOODS of animal origin (milk, cheese, meat, eggs, etc.) combined with plant foods are needed for optimum nutrition.

About two-thirds of our protein comes from animal foods.[1] Most animal protein has a high biological value, by virtue of its content of essential amino acids. Animal foods are also a source of vitamin B_{12}, a factor necessary for red blood cell regeneration. There is evidence that the presence of animal protein foods in the diet favors normal lipid metabolism.[2]

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Animal foods contain cholesterol, a lipid which is a normal constituent of all body cells, and which is synthesized by the body from substances derived from protein, fats, and carbohydrates. Disturbed lipid metabolism may result in deposition of cholesterol with fatty acids and protein in the inner walls of the blood vessels. This condition, atherosclerosis, is a forerunner of a number of cardiovascular diseases.[3]

Atherosclerosis is frequently associated with obesity, diabetes, and other metabolic disorders.[3,4] The cause of atherosclerosis has not been determined. Restriction of dietary cholesterol by elimination of animal foods has not been shown to be beneficial in its prevention or cure.[4]

The omission of the valuable nutrients found in these foods constitutes a nutritional risk not justified on the basis of currently available evidence.[5]

[1]Data supplied by Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, U.S.D.A. (April) 1952.

[2]Okey, R., and Turner, E. Dietary protein as a lipotropic agent for cholesterol. Fed. Proc. *10*:390 (March) 1951.

[3]Gofman, J. W., and Jones, H. B. Obesity, fat metabolism and cardiovascular disease. Circulation *5*:514 (April) 1952.

[4]Keys, A. Human atherosclerosis and the diet. Circulation *5*:115 (January) 1952.

[5]Hegsted, D. M. Further comments on cholesterol. Presented before American Medical Association, Los Angeles, December 1951.

This seal indicates that all nutrition statements in the advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

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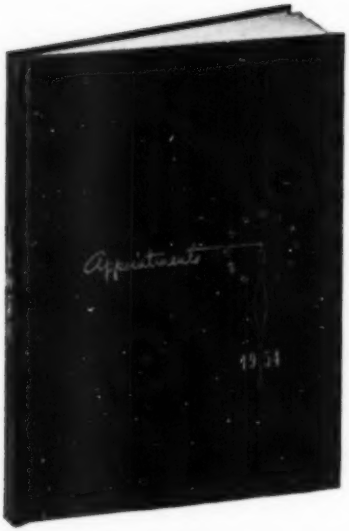

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